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UNITED STATES DEPARTMENT OF AGRICULTURE  
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A SURVEY OF FOREST INSECT INFESTATIONS ON CUTOVER AREAS  
IN CALIFORNIA

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**A SURVEY OF FOREST INSECT INFESTATIONS ON CUTOVER AREAS  
IN CALIFORNIA**

**INTRODUCTION**

Because of the importance of losses caused by forest insect infestations in virgin stands and the unplumbed possibilities of controlling those losses by variations of present cutting practices, the Bureau of Entomology and Plant Quarantine, with cooperation of the Office of Management, Region 5, U. S. Forest Service, projected and consummated a survey of losses on cutover areas during 1934.

The objects of this project were: (1) To determine the importance of losses caused by forest insects on cutover areas in California, and to determine the relationships existing between (2) loss and increment; (3) loss and site index; (4) loss and timber type; (5) loss and methods of cutting; (6) loss and time after cutting; (7) loss and diameter distribution; (8) loss and tree class distribution, as well as to determine the status of infestations in pole stands and reproduction on cutover areas.

The major features of infestations on cutover areas during 1932 and 1933 were the subject of study in an effort to determine existing conditions. If existing conditions were found to be unsatisfactory, it was hoped remedies would be suggested by the data secured.

**COST OF SURVEY**

Two field crews of from three to four men each were engaged in securing information from the middle of April to the middle of September. The Bureau of Entomology and Plant Quarantine supplied a portion of the funds to pay salaries and expenses, the U. S. Forest Service paying the major portion of salaries and expenses from INNIRA Insect Control funds.

The approximate costs of the work and the division of expense between the Bureau and Forest Service are shown in the following itemized list, consideration being given to deduction for time spent on other projects.

<b>U. S. Bureau of Entomology and Plant Quarantine</b>	
Supervision - Salary	500.00
Crew Supervisor - Salary	830.00
Assistant to Technicians- Salaries	400.00
Expenses and Transportation	<u>380.00</u> <b>3210.00</b>
 <b>U. S. Forest Service</b>	
Salaries - Junior Foresters	1660.00
"    Assistant to Technicians	1000.00
Expenses and transportation	<u>260.00</u> <b>2920.00</b>
Grand Total . . .	<b>5130.00</b>

## MATERIALS AND METHODS

Twenty three plots, varying in size from 120 to 640 acres each, and eight traverses covering 320 acres supplied information for analysis. Data from one other plot was rejected as it contained a considerable area of uncut timber.

The information gathered concerning each plot consisted of general information concerning the area, stand and logging operation and more specific information, using standard methods, concerning the amount of reserve timber, number of poles, reproduction conditions and losses in those three classes of growing materials. Increment borings were made from representatives of Bunning's tree classes 1, 2, 3 and 6 on each plot to determine increment and growth trends. Cores also were taken from infested trees in the reserve. A map, showing topography, timber type and cultural development was made for each plot.

Location of plots, and other descriptive information, is given in the following table:

TABLE 1.

Plot No:	Forest	Town:	ship	Range:	Section:	Acres:	Ownership:	Timber cut by	Year:	Cut:	Method of Logging
Co 1	Shasta		45N	2E	34	160	Govern't	Weed (Long-Bell) Lmb Co	1925:	Caterpillars and wheels	
Co 2		"	44N	1E	32	120	"	"	"	"	1922:
Co 3		"	44N	11	29 & 32	160	Private	"	"	"	1922:
Co 4		"	43N	3W	28	640	Govern't	Trespass by Weed	"	1905:	Horses and wheels
Co 5	Modoc		43N	5E	20	320	Private	Weed (Long-Bell)	"	1930:	Caterpillars
Co 6	Lassen		33N	9E	35	320	Govern't	Fruit Grow. Supply Co.	1929:	"	
Co 7		"	32N	8E	1	320	"	"	"	1931:	"
		"					"	"	"	1932:	
Co 8		"	32N	9E	23	320	"	"	"	1927:	"
		"					"	"	"	1928:	
Co 9		"	31N	9E	14	320	"	"	"	1922:	Big wheels
		"					"	"	"	1923:	
Co 10		"	30N	8E	13	320	"	Lassen Lmbr. & Box Co.	1919:	Horses and slip tongue wheels	
Co 11	Stanislaus		4N	18E	30 & 31	160	"	Pickering Lumber Co.	1928:	Donkey engine	
Co 12		"	4N	18E	28	240	"	"	"	1929:	Caterpillars
		"					"	"	"	1930:	
Co 13		"	5N	15E	27 & 34	160	Private	Manuel Mill	"	1904:	Bulls
		"					"	"	"	1906:	
Co 14		"	4N	18E	17, 19, 20	320	Govern't	Pickering Lumber Co.	1927:	Caterpillars and donkey engine	
		"					"	"	"	1928:	
Co 15		"	13	19E	14 & 15	160	"	Calif. Peach Grow. Assn	1920:	Donkey engines	
		"					"	"	"	1924:	
Co 16		"	2S	19E	14	160	Private	Yosemite Lumber Co.	1924:	"	"
Co 17	Sierra		43	20E	34	160	Govern't	Madera Sugar Pine Co.	1928:	Donkey engines, modified high lead	
Co 18		"	5S	20E	21	160	Private	Clarke Mill	1907:	Bulls and trucks	
Co 19		"	10S	24E	5	240	Govern't	Prescott Mill	1922:	Donkey engine, Horses and trucks	
		"					"	"	"	1923:	
Co 20		"	5S	21E	28	160	"	Madera Sugar Pine Co.	1905:	Low speed ground lead donkey engine	
		"					"	"	"	1906:	
Co 21		"	9S	25E	16	600	"	Fresno Flume and Irrigation Co.	1907:	"	"
		"					"	"	"	1911:	
Co 22		"	25N	13E	26	320	"	Clover Valley Lumber Co.	1926:	Caterpillars and big wheels	
		"					"	"	"	1927:	
Co 23	Plumas		24N	13E	17	320	"	Feather Riv. Lmbr. Co.	1928:	Caterpillars and Athey arches	

## RESULTS

### IMPORTANCE OF LOSSES ON CUTOVER AREAS

Table 2 shows losses in ponderosa pine on all plots. Table 3 gives similar information concerning the Jeffrey pine and sugar pine stands for plots on which those species occurred in appreciable amounts.

#### Ponderosa pine losses:

Losses in the reserves ranged from no loss to a loss of 130 b.m. per acre on the 23 plots. Average loss was 25.8 b.m. per acre. In percent of ponderosa pine reserve the average loss was 1.44%, with a maximum of 11.83% on CO 4. The maximum loss was 65% of the increment and the average 9%. On seven plots a net loss resulted, and on four the net increment was less than 1% of the stand. On eight plots the net increment was between 1 and 4% of the stand, and on two plots it exceeded 4%. No increment was determined for two of the plots.

#### Jeffrey pine losses:

Jeffrey pine occurred in appreciable amounts on but five plots in east side forest areas. Average per acre loss in Jeffrey pine was 13.6 b.m. or 0.78% of the Jeffrey pine reserve volume. The loss averaged 57% of the increment. One plot showed a net loss, two a net increment of less than 1% and two others showed a net increment of between 1 and 4%.

#### Sugar pine losses:

Nine plots contained sugar pine in appreciable amounts in the reserve stand. On three of these plots no increment could be determined from available data. Losses average 71% of the gross increment and net increment ranged from -2.65% of the stand to a gain of 2.93% per year. Losses ranged from nothing to 3.72% of the stand of CO 13, on which a small reserve occurred and on which a disproportionate amount of loss was caused by the death of one large tree, is excepted.

These results show that the possible gains on cutover lands were reduced by more than half, on the average, for the three pine species. However, examination of the record on individual plots shows a considerable variation. Although conditions were unsatisfactory, even critical on some plots, others showed satisfactory net gains.

### LOSS AND INCREMENT

In ponderosa pine the gross increment in relation to losses shows interesting results, not entirely in keeping with present ideas. The minimum increment on any plot is 0.73%, the maximum 5.06%. When the plots are

arranged in order of percent of increment, we find a considerable variation in the losses on plots having nearly similar rates of accretion. However, there is a tendency towards lighter losses on plots having the extremes in the increment range. 5 plots having increment of less than 1.50% of the stand have losses averaging 0.69% of the stand. 9 plots having increment ranging from 1.50 to 2.00% of the stand have losses averaging 2.57%. 4 plots having increment ranging from 2.00% to 2.50% have losses averaging 1.60% of the stand. 3 plots having increment of over 3.00% have losses averaging 0.16% of the stand.

The five plots on which Jeffrey pine occurs show increment varying from 1.02% to 3.46%. Although variation in results occurs, it also appears that the plots showing the intermediate rates of growth have the highest losses. However, the sample cannot be considered sufficient for any but tentative conclusions.

The six plots containing sugar pine have increments ranging from 1.07 to 2.95% of the stands. The heavier losses appear to be in these plots having the smallest increment rate. These sugar pine plot results show the accepted idea of the relation of infestation to growth rate.

#### LOSS AND SITE INDEX

Previous studies by Person (1) have shown a definite relation between infestation and site quality as expressed by the site index figure.

1. Person, H. L., Report on Studies of Insect Losses on Cutover Areas of District 5. ms. February 20, 1926

Examination of the information secured for the three pine species on the cutover plots examined shows some variation from that conclusion, when averages in the various site qualities represented by plots included in this study are examined. These averages are as follows:

Site quality:	Ponderosa	:	Jeffrey	:	Sugar					
Index figure:	Pine:		Pine:		Pine					
Plots:	No.:	Ave. %	Plots:	No.:	Ave. %					
	5	: 2	:	7.82	: 0	:	0	:	0	
	4	: 9	:	1.51	: 3	:	1.15	: 0	:	0
	3	: 4	:	0.21	: 2	:	0.18	: 1	:	0.00
	2	: 8	:	0.47	: 0	:	8	:	1.34	

In ponderosa pine the 8 plots in site 2 stands showed a greater loss than did those plots in site 3 stands. In sugar pine the better quality stands suffered the greater losses, although it must be considered that the sample in site 3 stands is insufficient to give much weight to the results.

When the variation in loss in each site group is considered, it is evident to me that but a small portion of the complete picture is given by the averages. Definite conclusions cannot be reached without more information gathered over a longer period of time.

#### LOSS AND TIMBER TYPE

It is to be expected that loss would vary with timber type in that the timber type classification, in general, is a classification of environmental conditions. The results secured by the survey are as follows:

Timber type: Ponderosa Pine: Jeffrey Pine : Sugar Pine	: No. : Ave. %: No. : Ave. % : No. : Ave. %
Plots : Loss : Plots : Loss : Plots: Loss	
PP	: 15 : 1.82 : 3 : 0.10 : 3 : 2.01
SP-PP	: 4 : 0.69 : : 4 : 1.12
SP-JP	: 2 : 0.00 : : 2 : 0.11
JP	: 2 : 3.02 : 2 : 1.86 : :

The above figures appear to show a relationship between timber type and amount of loss in terms of percent of total stand of the susceptible tree species. However, there is great variation in the plot figures that are averaged in the above table. Further analysis of the data secured by the survey has indicated the reasons for this great variation, but more complete data extending over a longer period is necessary before definite conclusions can be reached.

#### LOSS AND METHODS OF CUTTING

It has been observed that the selection of trees for removal of an entomological basis does not differ greatly from selection on a silvicultural basis. Under such conditions the removal of a small portion of the stand would leave a greater amount of volume in trees considered poor risks, and the removal of a larger proportion of a stand would leave fewer susceptible trees. In addition, there is a possibility that the volume of material available for infestation may be related to the amount of subsequent losses. The record in ponderosa pine is available for study, the sample as regards Jeffrey and sugar pine being considered, in general, too small to furnish a satisfactory basis.

#### Reserve volume per acre.

When the plots are arranged in order of volume of reserve on the ground in 1934, there appears to be no relationship between gross increment in % of stand and volume. Also no relationship exists between % of stand infested and volume. This is true even though only those plots in ponderosa pine type are considered.

Percent of total stand in Reserve.

When the plots are arranged according to the percent of stand remaining in reserve following cutting, the following is to be observed as regards infestation:

% of Stand in Reserve	Timber type	No. plots	Average % of stand infested per year in Ponderosa pine
40-48	SP-F	2	1.37
21-35	PP	6	0.76
17-18	JP	3	3.02
10-13	PP	4	4.03
Practically clear out	PP	3	0.26
clear out	SP-F	1	0.00

Examination of the averages fails to show any definite relationship between amount of loss and percent of stand remaining on the area. There is great variation on the individual plots included in the above classes.

The two plots in the SP-F type, cut lightly under the 1905-1909 selection cutting system, are CO 21 and CO 22 on the Sierra National Forest. Even under the favorable environmental conditions applying to those areas, it is evident losses are heavy and, when considered in connection with losses in virgin timber in nearby areas, are comparable in intensity.

On the plots in which 20 to 26% of the stand remains, four of the five plots, all on the Lassen National Forest in site 3 and site 4 timber, suffered losses of less than 0.20%. The fifth plot in site 5 stands on the Shasta National Forest suffered a loss of 3.02%. Apparently location is an important factor.

Ponderosa pine on the two plots on the Plumas National Forest in site 4 Jeffrey pine type, and with less than 20% of the reserve remaining, suffered heavy losses.

Four plots, CO 20 on the Sierra, CO 5 on the Modoc and CO 2 on the Shasta in site 4 quality, and CO 4 on the Shasta in site 5 quality timber, suffered losses of over 1% of the reserve in all cases. All these plots were cut to the extent of from 87 to 90% of the stand.

Cutting, to a point approaching clear cutting, apparently resulted in a negligible infestation. The best comparison of this is shown by CO 2 and CO 3 on the Shasta, which are located within 10 chains of each other. CO 2, cut to the extent of 89% of the stand, suffered an annual loss of 1.54% of the stand during the two year period covered by the record. CO 3, cut to the extent of 97 or 98% of the timber over 12" d.b.h. suffered a loss of but 0.06% of the stand.

The data do not supply a record of variations in cutting under similar conditions to an extent sufficient to supply conclusive evidence. However, it appears that a light cutting does not reduce infestations markedly, whereas a clear cut area in which only the younger and thriftier trees remain suffers practically no loss. It also is evident from qualitative observations, and in spite of the results in averages as given in the table, that loss subsequent to logging depends more on other environmental factors than the amount of timber removed from an area or the amount left and available for infestation.

#### LOSS AND TIME AFTER LOGGING

It is commonly held that, following logging, a slight flareup in insect activity is followed by a reduction of insect activity on cutover areas to a relatively unimportant level. Person (loc. cit) found that losses on areas that had been cut for some time were not greater than on areas cut but a few years before his examinations were made.

It is considered the many variables of the record secured by the 1934 survey prohibits a quantitative comparison. However, the records on CO 21, CO 22 and CO 4, which were covered by the Bureau of Entomology in previous surveys, bear out Person's contention. It would appear that infestations on cutover areas growing under certain conditions are not only important and resulting in a net depletion of the reserves, but also that infestations bear little relation to time of logging as regards intensity of infestation. It is apparent that infestations on cutover lands bear approximately the same relationship to environmental conditions as they are related in time, as do the variations of infestations in virgin stands.

#### LOSS AND DIAMETER DISTRIBUTION

Very definite theories have been evolved concerning selection of trees of certain diameters under virgin stand conditions. Plot results show considerable variation in this factor but, when averaged, show little evidence that the curves of diameter selection, as drawn by Person (2) for virgin stand apply on cutover areas. Figure 1 shows the results from the

2. Person, H. L. Tree Selection by the Western Pine Beetle, Journ. of Forestry 26; 564-578, 1928

cutover plots. Although some slight selection of certain diameter classes is evident, the selection appears to be nearly that of a chance selection by the beetles. Diameters above 34" have not been considered because of the small numbers of trees found in the larger diameter classes.

#### LOSS AND TREE CLASS DISTRIBUTION

Theories concerning the selection of certain types of trees have resulted from studies in virgin stands in which it was discovered that over-mature, codominant mature and suppressed trees were selected for infestation in larger proportions than their occurrence in the stand would warrant if selection were by chance. These so-called susceptible types of trees are, in general, included in Dunning's tree classification as class 4, 5, 6 and 7.

Examination of selection of tree classes on cutover areas shows a fairly close relationship between the proportions of the total number of infested and green trees in the several tree classes. There are deviations from a chance selection, but selection in cutover areas seems to be quite different from that in virgin stands. In Class 1, there apparently is a considerable lack of selection, while in Classes 6 and 7, there is evident a preference for suppressed trees. Figure 2 shows the relations of distribution of the tree classes in the cutover stands and distribution of insect-caused losses in those classes.

#### INFESTATIONS IN POLES

Examination of pole stands showed, with the exception of CO 5 on the Modoc forest, that few losses could be traced directly to slash disposal methods practiced during logging. Previous studies by the Bureau of Entomology and Plant Quarantine have shown that there is little danger of outbreaks of engraver beetles in pole stands left on logging operations, unless the operation is discontinued, the <sup>TOPS</sup> lopped or an excessive proportion of the slash shaded. On CO 5 no tops were lopped and slash was not burned. As a result of the shading caused by leaving the limbs on the tops, engraver beetles were enabled to breed up heavy populations and attack large groups of poles.

Pole infestations on other areas appeared to be normal in comparison with those in uncut stands. Several groups of sugar pine were infested with engraver beetles and mountain pine beetle on CO 12 and groups of white fir poles were infested by Scolytus ventralis. However, these losses occurred elsewhere on areas that had not been logged.

On CO 14 groups of incense cedar were infested by barkbeetles of the genus Phloeosinus and, in the more extreme habitats on that plot, ponderosa pine poles were infested to a slight extent by flathead borers. These losses can be considered normal, particularly when the situations under which they occurred are considered, and cannot be attributed to logging.

#### INFESTATIONS IN REPRODUCTION.

Several species of minor importance were discovered feeding on reproduction. Two species, causing injury in limited amounts or on limited areas, may prove to be of importance on cutover areas.

A pine sawfly (Neodiprion sp.), a web-spinning sawfly (Itycorsia sp.) and a needle-feeding moth (Zelleria haimbachii Busck) were found in limited numbers, causing a minor type of injury to ponderosa and jeffrey pine reproduction through defoliation. A pitch moth (Dioryctria sp. probably ponderosae Dyar) was abundant on poles and reproduction on the two Plumas plots. The attacks of this species on the twigs resulted in the death of those twigs but, under the conditions, the injury cannot be considered of great importance.

On the Plumas plots the work of an unidentified needleminer in white fir was found.

The work of an unidentified shoot moth, which apparently attacks and kills the terminals and to a lesser extent the laterals of a current season's growth, was found on the Lassen National Forest in Jeffrey pine reproduction and poles. Apparently new growth on trees of from 10 to 25 feet in height is preferred. The work of this species was also seen on the plums, and to a lesser extent on other east side forests. Thrifty shoots were attacked and, if a terminal is infested, the result is the formation of a crooked bala.

A tip moth (Rhyacionia pasadenana (Kearf.)) was found active in pure pine type in both the east and west side forest areas.

On 30-5 injury by the tip moth was found to be abundant and the cause of considerable malformation on reproduction of less than six feet in height and growing as dominant trees in unhabited areas. Random traverses to determine the incidence of injury to this type of reproduction showed, on material of less than four feet in height, that 48.7% of the terminals had been infested this season. Injury to the terminal is a primary type, forcing the production of new terminals from lateral shoots. As many as nine co-dominant terminals, eight of which were infested by the 1934 generation of insects, had been formed on one plant less than 2 feet high through previous attacks by the tip moth.

Count of all buds, to determine the percent infested, was made on 110 trees. All these were dominant trees and a grouping according to height showed a relationship between height and infestation as follows:

Height :	No. Trees:	No. infested:	No. uninfest- : counted :	% of buds : buds : ad buds : infested
0-2'	66	232	66 : 232 : 277	45.5
2-4'	23	25	23 : 25 : 155	16.0
4-6'	22	19	22 : 19 : 330	5.4

Although occasional infestation of buds on trees over six feet in height or on codominant trees in groups could be found, the injury was of little importance. In practically all such infestations lateral branch tips were the only ones infested.

Examinations on other areas showed infestations were heavier on cutover lands in the ponderosa pine type stands in which that species of tree occurred in relatively pure stands. Infestation was heavier in exposed, sunny areas. Evidences of attack were found on the Modoc, Lassen, Stanislaus and Sierra National Forests. Reports of injury have been received from Foresthill district of the Tahoe National Forest and the Sugar Hill plantation in the Warner Mountain division of the Modoc.

## RECOMMENDATIONS

The data suggest the importance of environmental factors other than those of stand, as well as the fact that slight modification of stand composition through light cutting practices does not benefit conditions appreciably. It would appear that present day recommendations for light cutting, with rigid selection of susceptible trees for removal, would be of no avail for two reasons. The first of these is that removal of a sufficient number of susceptible trees to change conditions would, in most problem areas, entail the removal of the greater portion of the stand. This is what is accomplished by present day selection and logging practice. The second reason is that the environmental features represented by the stand do not appear to be those that are critical in determining amount of loss or intensity of infestation. Accordingly it is considered inadvisable to advocate light cutting as a remedy for heavy losses, except on an experimental basis.

Those factors that appear to be critical in controlling infestation intensity are the physical factors of the environment. These cannot be changed, although variations in them in time may make change unnecessary. It would seem that investigation of the effects of those factors on the insects, as well as on the physiology of the tree species, would yield the greatest results.

The complex of the environment of cutover areas is undoubtedly greatly changed from that of a virgin stand growing under the same conditions. Accordingly, it does not seem logical to assume that results of investigations of infestations under virgin stand conditions apply to cutover areas.

Until such a time as the complex problems of infestations on cutover areas can be solved, it would appear that, on areas of heavy losses, salvage of infested timber is the best way of utilizing values. That such utilization would result in benefits from the entomological standpoint is not known. However, it is certain that, if methods could be worked out to bring the costs to a reasonable level, the method seems to be the only one, under present day environmental conditions, that stands a chance of paying a profit on the timber now going to waste.

TABLE II

## PONDAROSA PINE INFESTATIONS

Plot No.	Site	Timber	Stand	Reserve	total: Pond. P.		Gross Increment		Net Increment		Insect Loss Per Year		
					Index	Type	left	B.M. per Acre	per year	B.M. per Acre	Stand	Acre	Stand
CO 1:	5:	PP	30:	3,410:	50		3,410:	65	1.91	-65	-1.91:	130	5.82:
CO 2:	4:	PP	11:	1,232:	4		1,232:	21	1.70	2	0.16:	19	1.54:
CO 3:	4:	PP	2:	305:	4		305:	15	4.98	15	4.89:	7	0.09:
CO 4:	5:	PP	10:	857:	5		857:	16	1.84	-89	-9.99:	105	11.83:
CO 5:	4:	PP	12:	1,055:	4		1,055:	23	2.18	12	1.14:	11	1.04:
CO 6:	4:	PP	25:	2,736:	3		2,736:	45	1.63	39	1.42:	6	0.20:
CO 7:	3:	PP	33:	4,100:	3		4,100:	128	3.12	121	2.96:	7	0.16:
CO 8:	4:	PP	21:	1,391:	3		1,391:	15	1.09	14	1.05:	1	0.04:
CO 9:	3:	PP	34:	1,135:	3		1,135:	18	1.57	16	1.42:	2	0.15:
CO 10:	3:	PP	5:	35:	3		4,326:	44	1.01	36	0.82:	8	0.19:
CO 11:	2:	SP - PP	7:	6,787:	2		6,787:	113	1.66	113	1.66:	0	0.0:
CO 12:	2:	"	7:	2,213:	2		2,213:	44	1.97	44	1.97:	0	0.0:
CO 13:	2:	PP	7:	8,810:	2		8,810:	206	2.33	162	1.84:	44	0.49:
CO 14:	2:	PP	7:	5,296:	2		5,296:	89	1.30	42	0.80:	27	0.51:
CO 15:	3:	PP	7:	2,494:	3		2,494:	45	1.81	13	0.54:	58	2.35:
CO 16:	2:	SP - F	7:	71:	2		71:	7	7	-	-:	-	-:
CO 17:	2:	SP - F	12:	53:	2		53:	7	7	-	-:	-	-:
CO 18:	4:	PP	7:	1,795:	4		1,795:	91	5.06	87	4.85:	4	0.21:
CO 19:	4:	PP	13:	1,976:	4		1,976:	40	2.00	6	0.30:	34	1.70:
CO 20:	2:	SP - PP	40:	2,712:	2		2,712:	30	1.12	-16	-0.58:	46	1.70:
CO 21:	2:	"	48:	5,281:	2		5,281:	38	0.73	-17	-0.51:	55	1.04:
CO 22:	4:	JP	18:	711:	4		711:	11	1.61	-12	-1.65:	23	3.26:
CO 23:	4:	JP	17:	486:	4		486:	10	2.11	-3	-0.68:	14	2.77:
CO 24:	4:	JP	17:	486:	4		486:	10	2.11	-3	-0.68:	14	2.77:

TABLE III

## JEFFREY PINE INFESTATION

Plot No.	Site	Timber	% Total	Pond.	pine	Gross Increment	Net Increment	Per Year	Per Year	B.M.	Insect Loss Per Year
		Index	Type	Stand	Reserve						
				Left	B.M. per Acre	A:	B.M. per A:	Stand	B.M. per Acre	Stand	% Increment
CO 8		4	PP	21	1,874		17	1.02	15	0.88	2 : 0.14 : 12
CO 9		3	PP	34	2,722		51	1.88	48	1.77	3 : 0.11 : 6
CO 10		3	PP	35	1,839		64	3.46	59	3.22	5 : 0.24 : 8
CO 23		4	JP	18	1,929		21	1.11	-15	-0.79	37 : 1.90 : 176
CO 24		4	JP	17	1,454		26	1.77	5	0.34	21 : 1.42 : 81

## SUGAR PINE INFESTATION

CO 11		2	SP-PP	?	5,002		147	2.93	147	2.93	0 : 0.00 : 0
CO 12		2	SP-PP	?	3,268		72	2.10	62	1.89	10 : 0.29 : 14
CO 13		2	PP	?	267		?	?	?	?	15 : 3.73 : 0
CO 14		2	PP	?	1,188		30	2.55	27	2.24	4 : 0.31 : 13
CO 15		3	PP	?	1,596		77	?	?	?	0 : 0.00 : 0
CO 16		2	SP-F	?	200		?	?	?	?	0 : 0.00 : 0
CO 17		2	SP-F	12	6,337		162	2.55	148	2.33	14 : 0.22 : 9
CO 21		2	SP-PP	40	5,469		61	1.12	36	0.66	25 : 0.46 : 41
CO 22		2	SP-PP	48	6,494		69	1.07	-173	-2.65	242 : 3.72 : 350

FIG. 1

DISTRIBUTION OF GREEN AND INFESTED TREES  
IN PONDEROSA PINE RESERVE STANDS ON CUTOVER PLOTS  
BY DIAMETERS

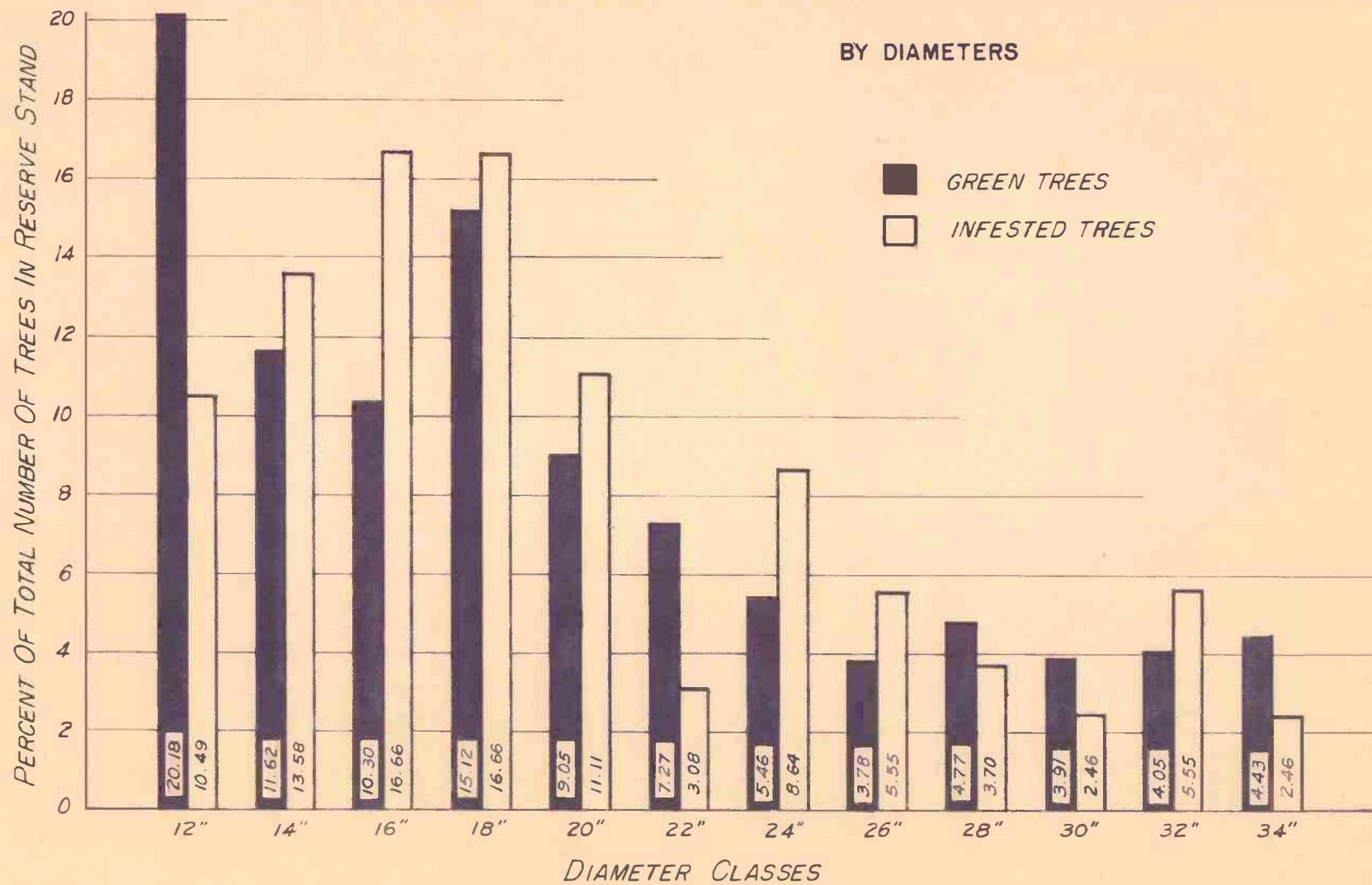
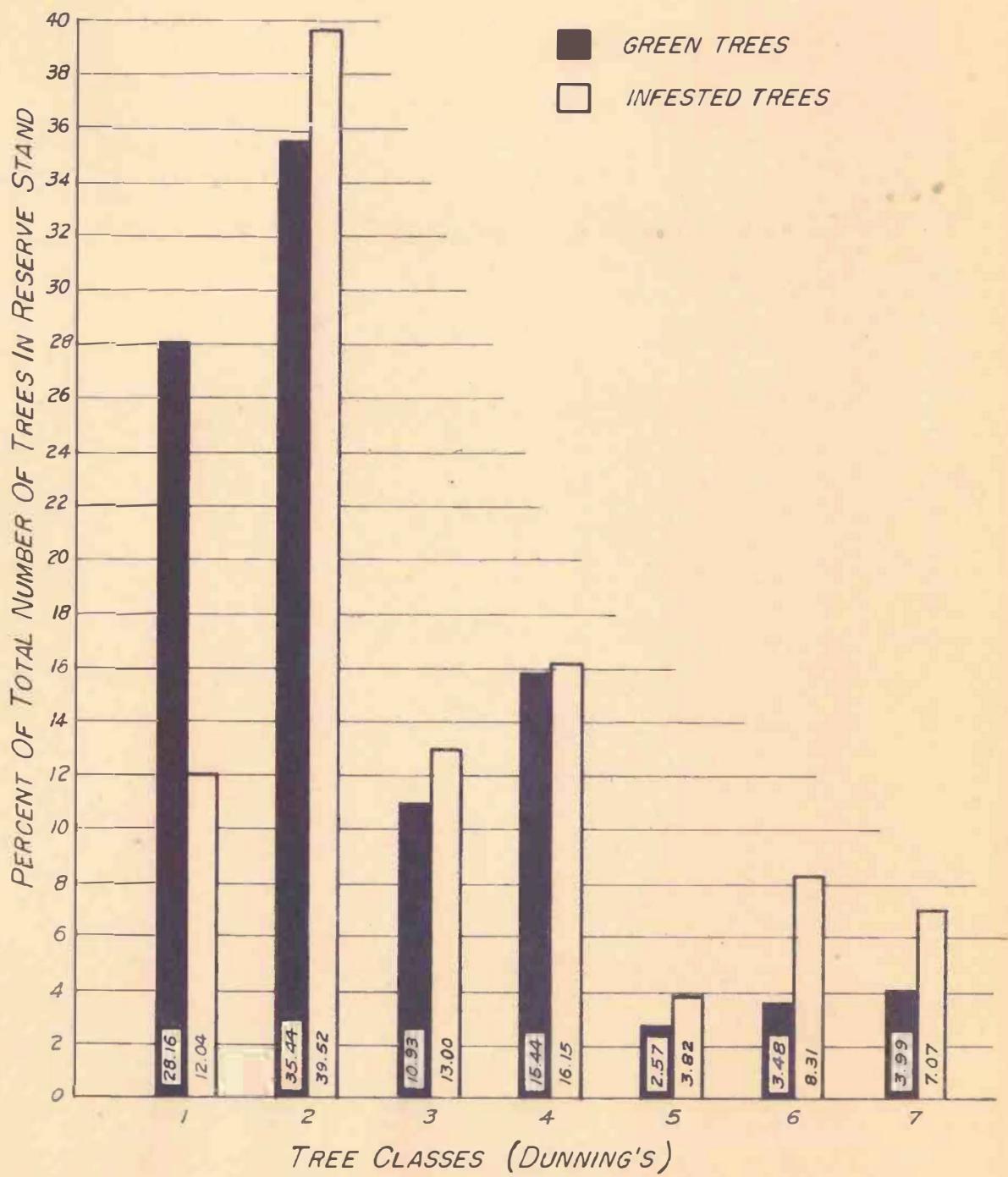


FIG. 2

DISTRIBUTION OF GREEN AND INFESTED TREES  
IN PONDEROSA PINE RESERVE STANDS ON CUTOVER PLOTS  
BY TREE CLASSES





#7590 A- Reserve stand on CO 5 in east side PP type stand, Modoc National Forest. Note the relatively light reserve of younger and more thrifty trees; the snags of trees killed by insects before logging took place; the broadcast slash and unlopped tops. Reproduction in the right center of the picture is heavily infested by tip moth (Rhyacionia pasadenana (Kearf.)). K.A. Salman, June 7, 1934.

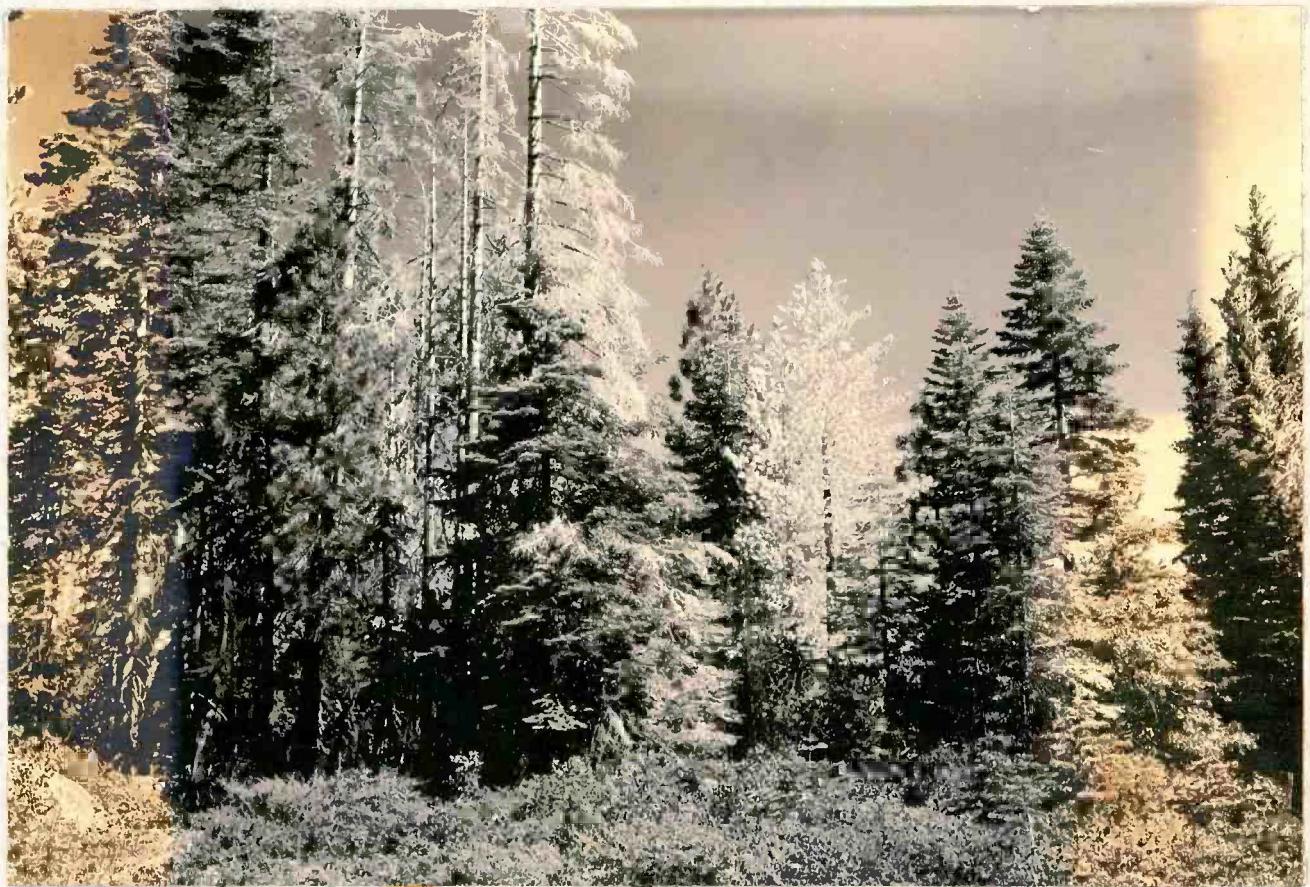


#7589 B- Results of tip moth attack on reproduction. CO.5, Modoc National Forest. This tree, about 18 inches high and 24 years old, formed nine codominant terminals as a result of previous tipmoth attack. Eight of these terminals, as well as three of the five lateral buds at the tips of branches were attacked by tip moth in 1934. K. A. Salman, June 7, 1934.



#8576 - Attacks of an undetermined species of Lepidoptera on terminal growth of Jeffrey pine reproduction in east side type forests. Note the larva in place within the pith that has been mined out and the effects of attack on the growth of needles of the current year. The thickness of the infested shoots is evidence of the great vigor of the terminals before attack.

J.M. Miller, July 2, 1934.



#8686- Infestation in fir and sugar pine poles and reserve on CO 12, Stanislaus National Forest. This illustrates group kill by Scolytus ventralis Lec. and Dendroctonus monticola Hopk. in west side SP-PP or SP-F type. J.E.Patterson, June, 1934.



#8547 - Sugar pine Sale Area near Ellis Meadow, Sierra National Forest. This illustrates loss of seed trees soon after logging. This type of infestation contributes greatly to the production of net loss on cutover areas.- J.M.Miller, October 22, 1931.



#8575 - Loss of sugar pine seed trees some time after logging on CO 12, Stanislaus National Forest. This type of loss appears to be the result of reaction to environmental conditions somewhat similar to that of nearby virgin timber stands.

This loss is an important factor in reducing the timber producing capacity of cutover areas.

J.M. Miller - June 21, 1934.

## APPENDIX

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APPENDIX  
FIELD METHODS

Plot Selection

1. The plot system was used throughout except for the use of traverses to secure supplementary information.
2. Plots were selected as typical of larger areas and not because of insect losses.
3. The standard plot is 320 acres. Where previous records were available or where ownership, timber type or differences in logging, marking methods, or environmental factors made larger or smaller plots advisable, the size of plot was modified to fit conditions.
4. Efforts were made to distribute the plots as to area, timber, type, date of logging, amount of reserve and methods of marking and logging.
5. An isolation strip of similar timber type that had been treated in a like manner was secured wherever possible.

Establishment of plots

1. Each plot was definitely located in relation to legal land lines. Corners and cruise lines were distinctly marked by stakes or blazes.
2. A map showing timber type, stand conditions, outstanding topographic and cultural features was made. Deviation and other pertinent data was given in the map legend. Location of infested trees and features of infestation in poles and reproduction also were noted.
3. Information secured consisted of the following:
  - a. A 10% estimate of reserve stand (over 11" d.b.h.) secured information concerning the measured d.b.h., estimated number of logs, tree class and tree species for each tree on the cruise strips.
  - b. A 5 or 10% estimate of poles was made in a similar manner and similar information was secured. The tree classification date was not used in this study.

- c. A 1% estimate of reproduction was secured by using plots 1/2 by 2 chains in size located at equal intervals on the cruise lines. Methods used were as given on page 8 of "Forest Management Handbook, California District, 1928".
- d. Insect losses in pine reserve and poles were secured by a 100% cruise of the area. On some west side type plots a 10% cruise of infested poles was made. Each infested tree of over 11" d.b.h. was examined, blazed and numbered. Information concerning d.b.h., number of logs, tree species, tree number in the infestation series, plot number, insect species responsible for death, seasonal brood concerned, year of infestation, brood stages present, tree class, date of spotting and name of spotter was marked on a tree record. Infested poles were not marked but d.b.h., tree species and insect species responsible for death were noted in a list.
- e. Cores of green and infested pine trees in the reserve were secured. The number of cores from infested trees depended on the number of trees available. Attempts were made to secure from 125 to 150 cores from green pine trees on each plot. Cores from green trees were distributed among the tree and diameter classes present on the plot in proportion to the abundance of the several classes on the plot.
- f. Where more than one pine species was present on a plot in significant amounts cores were secured in the manner given above for each pine species.
- g. Each core was marked with the plot number and, in the case of green trees, with the diameter and class. Average trees were selected. Cores from infested trees were marked with the infestation number given the tree.
- h. Infestation in reproduction was determined qualitatively by examination of the individuals on the reproduction plots. It was intended that quantitative data would be secured and that methods utilized would have to be adapted to each species concerned. However, quantitative information was obtained on but one plot.
- i. Size classification used was that considered standard in forest practice.  
Tree classification followed Dunning's system.  
Diameters were obtained by use of a diameter tape and Biltmore stick.  
Heights were checked frequently by means of a Forest Service hypsometer.
- j. Information concerning points 1 to 17 as given in the analysis of each plot were secured in the field or from the local Forest Service office records.

## OFFICE METHODS

### Descriptive data

Descriptive information concerning each plot as given under headings 1-17 in each plot analysis was checked and rearranged, insofar as available information would permit, in a standard form.

### Quantitative data

Information given under the headings 17-26 were standardized in the following manner.

#### 17. Cutover cruise (Bureau of Entomology and Plant Quarantine)

##### a. Number of trees per plot.

1. Pine species - green cruise x factor 1932-33-34 insect losses losses from other causes during period 1932-34.
2. Other merchantable species - green cruise x factor.
3. Non merchantable species - green cruise x factor.

##### b. Volume on plot (as of 1932)

1. Pine species - green cruise x factor 1934 insect caused losses losses from other causes - increment of 1932-33 1932-33 insect caused losses.
2. Other merchantable species - green cruise x factor.
3. Non merchantable species - no volume given.

- c. Number of trees per acre - total number in (17,a, 1 or 2) divided by number of acres in plot.
- d. Percent of total volume - volume per acre for each species divided by total volume per acre.
- e. Volume of average tree - total volume in (17,b, 1 or 2) divided by total number of trees (17 a, 1 or 2)

#### 18. Insect caused losses.

Given for significant pine species only and on a per acre basis.

- a. Stand at beginning of 1932 - total number of trees (17 a 1) divided by acreage, and total volume (17 b 1) divided by acreage.
- b. 1932-33 losses in reserve - total losses in trees and volume divided by acreage.
- c. Loss per year in reserve - 18 b divided by 2.
- d. Percent of stand lost per year - 18 c divided by 18 a.
- e. Increment per year - total volume increment per year divided by acreage. Increment is determined as follows: - Rings per inch of radius are measured on the cores and averaged for each 2 inch diameter class. Average volume for each diameter class is determined from the green cruise, this curved and the curve smoothed. The volume difference in increase from one diameter class to the next (one inch radius growth) is determined. This divided by the number of rings per inch gives the board foot increment per year for each diameter class. The figures divided by the average volume of each class gives the percent of increment. As all classes were not always represented, these figures were curved and the curve smoothed to determine the percent of increment per year in each class. The cruise volume x factor 1934 losses and losses from other causes, or the total volume in each diameter class is multiplied by the % of increment in each class as determined above. This gives the total increment in each diameter class group. These figures are added to give the total increment for the plot. Increment per acre was secured by dividing the total increment for the plot by the acreage.
- f. Net gain or loss per year - 18 c less 18c if gain occurred.

19. Composition of infestation - divide the total infested volume for 1923-33 into volume infested by each insect species involved in the loss.

20. Tree selection (Dunning's - significant pine species only.)

- a. Total number of trees in each class - The following arranged by tree classes - green cruise x factor 32,33, & 34 insect losses losses from other causes.
- b. Total infested trees in each class - 32 & 33 losses by tree classes.
- c. Percent infested per year in each class - relation of 20 c to 18 d.

21. Diameter selection (significant pine species only)
  - a. Total number of trees in each class - The following arranged by diameter classes - green cruise x factor 32,33 & 34 insect losses losses from other causes.
  - b. Total infested trees in each class - 32-33 losses by diameters.
  - c. Percent infested per year in each class - 21 b divided by 21 a, the result divided by 2.
  - d. Relation to average loss in each class - relation of 21 c to 18 d.
22. Growth trends in reserve - graph compiled from measurements of green cores in terms of hundredths of millimeters radial growth per year. Selection for measurement from the total number of cores was based on average trees having a distribution in the various diameter and tree classes approximately proportional to the occurrence of these classes in the stand.
23. Pole stands and losses. Infestation in pine species only considered in the losses.
  - a. Stand at beginning of 1932 - Cruise distribution as to tree species and to diameters within each tree species are multiplied by the plot factor to give the total number of trees of each species in the pole stands at the beginning of the 1932 season. In pine species the figure secured by the above method has added to it the losses in each species and each diameter classes recorded by the infested pole cruise.
  - b. 1932-33 losses - These are secured from cruise figures modified according to the percent of the cruise.
  - c. Percent infested per year - 23 b divided by 23 a, the result divided by 2.
  - d. Relation to average loss - Totals for plot in 23 b divided by totals for plot in 23 a gives a figure used to compare with 23 c.
24. Composition of infestation in poles. This is secured as in 19.
25. Reproduction conditions. Data from reproduction cruise is summarized as outlined on pages 8 and 15 of the Forest Management Handbook, California District, 1928.
26. Under this heading observations of a qualitative nature are given.

## INSTRUCTIONS FOR CUTOVER STUDIES

NOTE: These instructions are to meet general conditions but cannot be considered inflexible or for all conditions. Modification as to methods must be made to suit special areas although the objectives of the study remain the same.

As these instructions have been drawn up from field observation of east side type alone, it is obvious that they may not fit other conditions. Changes may be made but the information collected by the two crews must be kept comparable.

### OBJECTIVES.

1. To determine, under different site conditions and on different cutover areas.
  - a. The insect caused losses in the reserve, including seed trees, and poles left after logging in terms of trees, diameters, volumes and insect species where possible.
  - b. The types of trees (Keen's) selected by the insects for attack.
  - c. The core patterns of infested trees as compared with those of green trees.
  - d. The proportion of the reserve volume attacked.
2. To determine the net b.m. gain or loss in the reserve on the plot.
3. To determine the effects and importance of insect attack on poles and reproduction.

### REQUIREMENTS.

In order to obtain the objectives and make comparisons of different methods of cutting under different site conditions on the several areas, it will be necessary to secure basic data. The forest service has, in most cases, this data secured by certain methods. Where such data has not been secured, it will be necessary to secure them by similar methods. Methods used by the Forest Service, amended somewhat so as to be satisfactory from the entomological standpoint, are given herein.

Data necessary are original stand and composition, methods of logging, amount of cut, date of logging, etc. which are given in outline I of this set of instructions.

The plot system will be used throughout although where deemed advisable supplementary information can be secured by traverses or supplementary reproduction plots designed to cover special conditions. In such traverses green tree cruises should be made and methods in both cases of handling infestations or reproduction conditions should be the same as outlined below.

Each plot will be definitely established and located. Corners should be marked distinctly by stakes and/or blazes. A complete map should be made showing type, stand conditions, outstanding topographical and cultural features and compass deviation and other pertinent data should be included. The information requested in the Plot data form, plus that required in outline L should be secured. Where deemed advisable and on instructions, cutover plots may be tagged as part of the Regional Survey plot system for further study.

Plots should be selected as typical of larger areas and not primarily for insect loss although in reproduction plots typical and outstanding infestations may be made the object of a separate small plot study. Different types of marking or logging methods, different timber types should be represented and the standard requirements of sample plots, particularly those concerning a zone of similar conditions, should apply.

#### PLOT METHODS.

##### Reserve Stands.

Reserve is considered to have a diameter of 11.5" and over. Poles are considered to be between 3.5" and 11.5" d.b.h.

##### Intensity of Cruise

40 to 160 acres	-	20%
Over 160 acres	-	10%

##### Site Classification

Five site classes are recognized, based upon the total height attained by the species. They are as follows:

Site I	-	175 feet or over
II	-	150 to 175 feet
III	-	125 to 150 feet
IV	-	100 to 125 feet
V	-	75 to 100 feet

Under 75 feet can be carried as site V but is usually non-merchantable.

Ponderosa pine may generally be used as a key species. In the absence of ponderosa pine, sugar pine should be used; or in the fir type either white or red fir. Several height determinations should be made, based on total height of mature dominant trees but avoiding the exceptional maximum trees.

### Stand Cruise.

Tally and give a number to each tree on the strips that is over 12" d.b.h. Take diameter and logs. Leave space for volume. Take tree class. This listing can be made on spotting or treating records as in the Regional Survey work.

Make distinctions between tree species with suitable symbols. Take a representative sample of cores from the pine species securing approximately proportional representation of diameter, tree classes and pine species. 30 to 100 cores should be sufficient from the reserve in most cases and from 25 to 50 of the dominant and codominant poles should be cored. Mark each core with number of tree and plot designation with indelible pencil. Dry cores before packing and species other than pines will not be considered for increment.

Handling of stand cruise of poles is as yet, uncertain. It is necessary at least to know the number of dominant and codominant poles yet, in some areas, it would be too much to determine this from a strip cruise. It may be possible to secure such data from plots as in the case of reproduction plots although I believe the strip cruise, with counting of dominant and codominant poles and coring of a representative series, would be the better method.

### Insect Losses in Reserve.

Make out the customary tree record for all infested trees over 12" d.b.h. and blaze each tree. Map location and, from recent kills, take a core, numbering correctly with number and plot designation. This is to determine the difference, if any, between the core patterns of infested and green trees. If a 100% loss estimate in poles is made, it should be conditioned on a satisfactory cruise of poles to the extent of 10%. In this case all poles infested in the plot can be called to the compassman with diameter and insect infestation who will note them on a spotting record. If the subplot method of securing green cruise of poles is used, it may be advisable to note pole mortality only on the subplots.

The Forest Service notes poles of the dominant and codominant class only in considering growth. It may be necessary to class poles in a similar manner in that suppressed poles infested by insects could not, if they lived, be considered a part of the future crop.

### Other Losses, etc.

Losses such as windfalls, etc., not caused by insects, should be noted as to number of trees and amount of volume.

### Reproduction plots.

The purpose of these plots is to secure the incidence of important injuries. It is suggested that tentative plots, to sample the infestation, be laid out two chains long, by  $\frac{1}{2}$  to 1 chain in width, on the cruise lines and in sufficient numbers to sample the reproduction and give an average. Each plot should be marked at its corners by scribed stakes and location as subplots on the larger plot map should be made.

General reconnaissance of these subplots should be made first and types of injury to reproduction determined. It is not intended that all injury, even to minor defects be considered, but only injury resulting from noticeable insect activity or resulting in noticeable effect on the stand either through abundance or importance.

It is difficult to determine just what procedure should be followed in these subplots, but explanation of the reconnaissance in the Lasco thinning area and methods of determining the essential information on the insects found there will suffice to explain the purposes.

The reconnaissance showed:

1. Magdalis (?) injury to terminals and branch tips.
2. Fungus injury to roots and root collars followed, in some cases by attacks by secondary insects or by primary insects.

Information desired in this particular type of infestation is as follows:

1. Incidence of each type of injury, i. e., infested and noninfested stock in a given area. In other words, it is wished to sample the area and determine the percent of stand that is infested by either injury.
2. Type of tree attacked. Are they less than 6" in height, 6" to 3.5" in diameter, or 3.5" to 11.5" in diameter.
3. Place of infested trees in the stand. Are they (1) dominant or codominant (2) oppressed or suppressed and (3) injured.
4. Is the infestation primary or secondary. In the case of Magdalis the twig injury is secondary and the terminal primary. In the case of the fungus, or other pole infesting organisms, the infestation can only be considered primary unless it can be found to be partial and non-spreading so as to become primary.

In the case of the root rot it is wished to determine, not only the amount of infestation, but also if secondary or primary insects follow, or do insects always follow the root infection.

In order to satisfy such questions and secure quantitative data it is felt we must know the following of all reproduction, infested and noninfested on each plot.

1. Sizes, classified into less than 6", 6" to 3.5", 3.5" to 11.5"
2. Place in canopy, - dominant and codominant, oppressed and suppressed, or injured.
3. Incidence of injury- non-infested and infested in numbers of trees.
4. If secondary and primary injury is possible through the actions of one species we should know how many infested trees have primary or secondary infestations. There may also be a time element in that past attacks must be considered.

In addition, descriptions of injury, notes, photographs, etc. are desirable.

It will be seen that the amount of work necessary to do will depend on what is found by reconnaissance of the reproduction. In the Lassen it is pretty well decided that much work will be necessary. In the weed cutover it is also thought, due to extensive dying of reproduction that a considerable amount of attention will have to be paid to the injuries. In the Hugh Ryan Canyon (Old Miami cutover), Retinodiplosis injuries are current and may make much work necessary. Other areas are not known well enough as yet. Standard methods undoubtedly can be worked out after further field experience.

Collections should be made both for rearing of insects at Hackamore, Bass Lake and Berkeley and for securing adequate work specimens.

Information concerning material should accompany all such material to rearing centers.

Forest, area, plot, subplot, date, collector, tree species, insect species (if determined) noted.

It probably would be best to defer collection in an area until the material can be shipped or carried to a rearing center with little delay.

Berkeley, California.  
May 24, 1934

K. A. Salman  
Associate Entomologist

## Outline 1, Sample

## GENERAL DESCRIPTIVE DATA

Plot	Location
1. Land Classification	Government, PP Type, cutover 260 acres
	Government, Brushland, Restocking 60 "
	320 Acres
2. Sale,	Lassen Lumber and Box Co. 11-16-17
	Marble Flat Unit - Eastern Lassen Working Circle
3. Period of cutting -	1918-1919
4. Marking Practice -	Group selection. Heavy cutting of thrifty mature, mature and overmature classes. Thrifty trees left in groups so far as possible. Marked by F. S. Bown
5. Logging -	Horse - Big wheel
6. Slash Disposal -	Brush piles. Limbs of all sizes included in piles. Burned in fall after first heavy rains.
7. Ground cover -	Needles and duff over 90% of area. Remninder snow brush ( <i>Genzothus velutinus</i> )
8. Cutover cruise -	1921, Estimator, A.E. Westlund, Compassman, F.S. Bown. 10% strip estimate
9. Cut per acre.	19,800 feet b.m.
Left per acre	<u>2,250</u> " "
	22,050
	percent - 89.8
	<u>10.2</u>
	100.0

## SUPPLEMENTARY INSTRUCTIONS FOR CUTOVER STUDIES

These instructions supplement and replace, in case of conflict, those of May 24, 1934. The changes have been made to facilitate the work and bring it more in line with current forest service practice.

**Objectives**—Remain the same as in the previous memorandum with the exception that, in place of Keen's tree classes, Dunning's tree classification will be used.

**Requirements**—Remain the same except that the data desired (outline 1 P and Plot data form) are given in order at the end of this outline.

### Plot Methods—Reserve stand.

Reserve is as considered heretofore.

Intensity of green cruise is as given.

Site Classification is standard.

**Green Cruise**—Tally each green tree on the strip on a spotting record form giving tree species, diameter breast height, logs, volume, and Dunning's tree class. This applies to both reserve and poles. Organization of a three man crew for this work consists of compassman dragging a chain and rear chainman who puts in stakes and helps in tallying the reprekretion plots. The third man follows the compass line and cruises the reserve and poles as noted above. If there is too much material for him to handle in the one cruise, the poles may be omitted and taken later in connection with the cores as a 5% Cruise. No cores are to be taken in this cruise.

**Insect Losses in reserve and poles**, Make out the customary tree record for all infested poles over 12" d.b.h. Blaze and number each tree and map each tree location. It will be possible to number, in a separate series for each year, the 1933 and 1934 trees, but little can be done for trees infested at an earlier date. It is suggested that losses for three years back be taken, although, if a longer period can be covered with any accuracy, the period may be extended. The 1931 and 1932 trees can be grouped in one series for specification as to year and generation would be but a guess in most cases. Infested poles are called to the compassman by diameter, height, Dunning's tree class and insect concerned in the infestation. These he notes on a spotting record. Organization of the crew for this work consists of compassman and mapper and two spotters. The width of strip taken on the plots will depend on conditions.

**Other losses**—as given in previous instructions.

**Reproduction plots**—The methods given in previous instructions.

apply. The work is done during the green cruise of the plot. The compassman drags the chain behind him and, on the 1,3,5,7, tally lines the series of plots are installed. A stake is set at the 1,3,5,7,9,11,13, and 15 tally marks. If the plot is a north-south plot the reproduction plots will be north the tally stakes on

one line and south on the next so that there is a partial staggering as to location.

Insect injury to reproduction.- During the determination of percent of stocking and kind of reproduction examination should be made for insect injury of an important nature on any part of the reproduction and, from these, estimates as to the type of reproduction infested location as to site, and importance of the injury can be made and noted on each reproduction plot sheet. Later methods adapted to securing quantitative data on the injury can be utilized but these of course may be entirely different for different types of injury.

Determination of increment.- Cores of infested trees will be taken during the loss cruise from 1934 trees or 1935 if in satisfactory condition. These shall be marked with tree number and plot number. A final cruise to determine growth will be made. If it is necessary to make a 5% cruise of poles in connection with this, the crew will run two miles of strip along typical timber lines (select two). One man will cruise the poles, one man will act as compassman and, by tallying, determine that the cores are selected in the approximate proportions of dominant tree classes and diameter classes as shown by the green cruise. The third man will core dominant trees, which are the only ones used in determining growth (Dunning's classes 1, 2, 3, and 3) and mark each core with diameter and tree class as well as plot number. Diameters from 8" up will be taken.

#### Additional notes.-

In most cutover areas the Forest Service has made cruises of a similar nature and secured similar information. They have not, however, secured the tree class composition of the stands nor have they determined the insect losses except in a very general way. Usually, the work has not been recent. In such cases all work should be done. However, if recent figures can be secured, they may be used and increment figures, if available in satisfactory form, can be used, thus cutting out the necessity for doing and securing increment figures.

The data to be secured concerning each plot, either by original cruise or from Forest Service or Private Lumber Company records are as follows:

Plot

Location

Forest

Date of Cruise

Observers

Land Classification- Owner, timber type, conditions of management with acreage of each type.

Sale designation or timber operation designation.

Period of Cutting

Site classification

Marking Practice

S                   Method of Logging  
                  Slash disposal  
                  Ground Cover  
                  Cutover cruises (Forest Service) date, personnel, % estimate.  
                  Cut per acre  
                  Left per acre (Previous Cruises) These figures in b.m. and  
                          percent.  
                  Total stand per acre.

In addition to the above information, the original estimate should be secured as well as the amount cut on the plot and the cut-over estimates. The information secured by the crew will be available for use in a stand table tree class or composition table, 1934 estimate table, increment figures, loss figures and comparison of loss with green tree stand in the reserve. In the poles the composition of pole, stands and density can be secured from the figures as well as information on distribution of losses, tree types and insects causing loss.

K. A. Salman  
Associate Entomologist

Berkeley-California  
June 18, 1934

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#### PLOT ANALYSES

The results of crusis on plots and travoses were analized in order to supply a basis for conclusion. The following data gives the analysis results in detail.

## TRAVERSE #2 CUTOVER AREA

Acreage Cruised 40 acres

Location - T 45 N, R 2 E. Sec. 23. Strip  $\frac{1}{2}$  mile long, 10 chains wide in SWNW and NWNW

Ownership - U. S. Government,

Date of logging--

Site - 5

Method of logging--

Type - Ponderosa pine (marginal)

Reproduction - practically none.

Percent estimate - Green Cruise 10%, Insect losses 100%

Record of stand and losses.

Stand at end of	40 acre area		per acre	
	Trees	Volume b.m.	Trees	Volume B.m.
1931 Ponderosa pine	563	186,740	14.1	4,669
1932-1933 losses	61	21,460	1.5	537
% loss 1932-1933	10.8	11.5		
% loss per year.	5.4%	5.7%		
Composition of infestation (% of volume)				
D. brevicomis-----	47.3			
Melanophila spp.-----	35.5			
D. monticolae-----	8.8			
Mixed infestation-----	7.1			
Unknown cause of death---	1.3			

### Tree Selection (Dunning's)

Tree class	Total	Infested	% infested	Relation
	No. trees	2.years	per year	to ave.
1	20	0	0.0	-
2	278	26	4.7	-
3	131	11	4.2	-
4	108	8	3.7	-
5	6	6	50.0	-
6	15	5	16.7	-
7	5	5	50.0	-

### Diameter Selection

D.B.H.	Total	Infested	% Infested	Relation
	No. trees	2.years	per year	to ave.
12	65	5	3.8	-
14	35	4	5.7	-
16	51	11	10.3	-
18	99	8	4.0	-
20	135	15	5.5	-
22	87	7	4.0	-
24	24	4	8.3	-
26	13	3	11.5	-
28	41	1	1.2	-
30	10	0	0.0	-
32	1	1	50.0	-
34	1	1	50.0	-
36	1	1	50.0	-

TRIVIRE # 3 CUTOVER AREA

Acreage Cruised - 20

Location - T 45 N, R 2 E S 23. Strip 20 chains long, 10 chains wide in N.E.W.

Ownership - Government

Date of logging -

Method of logging -

Site Class - 5

Type - Ponderosa pine (marginal)

Reproduction - Practically absent.

Percent estimate - Green Cruise - 10 %, Insect losses - 100 %.

Record of stand and losses.

20 Acre area

	trees	Volume b.m.	Trees	Volume b.m.
--	-------	-------------	-------	-------------

Stand at end of

1931 season.	249	119,490	12.5	5,975
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1932-1933 losses	25	8,620	1.3	451
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% loss 1932-1933	10.0	7.8		
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Loss per year	5.0%	3.6%		
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Composition of infestation (% of volume)

<i>D. brevicornis</i>	50.2
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<i>Melanophila</i> spp.	38.1
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<i>D. monticolae</i>	11.8
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Mixed infestation	5.9
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Tree Selection (Dunning's)

Class	Total no	Infested	% Infested	Relation
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	trees	2 yrs.	per year	to ave.
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1	2	2	50.0	-
---	---	---	------	---

2	132	11	4.1	-
---	-----	----	-----	---

3	31	1	3.2	-
---	----	---	-----	---

4	54	4	7.4	-
---	----	---	-----	---

5	22	1	5.0	-
---	----	---	-----	---

6	2	2	50.0	-
---	---	---	------	---

7	6	4	33.3	-
---	---	---	------	---

Diameter selection

D.B.H.	Total no	Infested	% Infested	Relation
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	trees	2 yrs.	per year	to ave.
--	-------	--------	----------	---------

12	83	1	0.6	-
----	----	---	-----	---

14	16	2	12.5	-
----	----	---	------	---

16	12	2	16.7	-
----	----	---	------	---

18	14	3	21.4	-
----	----	---	------	---

20	24	4	16.7	-
----	----	---	------	---

22	31	1	3.2	-
----	----	---	-----	---

24	13	3	23.1	-
----	----	---	------	---

26	3	2	66.7	-
----	---	---	------	---

28	3	3	100.0	-
----	---	---	-------	---

30	10	0	0.0	-
----	----	---	-----	---

32	20	0	0.0	-
----	----	---	-----	---

34	10	0	0.0	-
----	----	---	-----	---

36	10	0	0.0	-
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TRAVERSE # 4-- CUTOVER AREA

Acreage cruised - 30 acres

Location - 45 N, R 2 E, Sect. 36 Strip 30 chains long, 10 chains wide  
in NWNE NWNW

Ownership - Government

Date of Logging-

Method of logging

Stand Class - 5

Type - Ponderosa pine

Reproduction - practically absent.

Percent estimate - Green cruise - 10%, Insect losses - 100%.

Record of stand and losses--

Stand at end of 1931 season	30 acre area		per acre	
	trees	Volume b.m.	trees	Volume, b.m.
1932-1933 losses	40	14,800	2.0	710
% loss 1932-1933	11.6	11.8		355
% loss per year	5.8 %	5.9 %		

Composition of infestation (% of volume)

D. brevicornis	81.4
Melanophila spp.	14.8
D. monticolae	0.4
Mixed infestation	2.0
Unknown cause of death	1.4

Tree selection (Dunning's)

Class Total no Infested % Infested Relation.

	trees	2 yrs	per year	to ave.
1	44	3	3.4	-
2	184	20	5.4	-
3	23	5	6.5	-
4	44	4	4.5	-
5	14	4	14.3	-
6	23	5	6.5	-
7	13	3	11.5	-

Diameter selection

D. H. H.	Total no trees	Infested 2 yrs	% Infested per year	Relation to ave.
12	30	10	16.6	-
14	33	10	15.1	-
16	76	6	3.9	-
18	71	1	0.7	-
20	32	2	3.1	-
22	34	2	2.9	-
24	21	1	2.4	-
26	12	2	8.5	-
28	23	3	6.5	-
30	0	0	0.0	-
32	18	2	8.3	-
34	1	1	50.0	-

TRAVERSE #5, CUTOVER AREA.

Acreage cruised - 20

Location - 45 N, R 2 E, Secs. 35 & 36 Strip 20 chains long, chains wide running south from corner ~~26/25~~ on section line.

~~35/36~~

Ownership - Government

Date of logging -

Method of logging -

Site class - 5

Type - Ponderosa pine

Reproduction - absent

Percent estimate - Green cruise 10% - Insect losses, 100%.

Record of Stand and losses.-

	20 Acre Area		per acre	
	trees	volume b.m.	trees	volume b.m.
Stand at end of				
1931	154	83,570	7.7	4179
1932-1933 losses	43	14,830	2.1	742
% loss, 1932-1933	27.3	17.7		
% loss per year	13.6 %	8.9%		

Composition of infestation (% of volume)

<i>B. brevicornis</i> -----	50.6
<i>Melanophila</i> spp.-----	18.2
<i>B. monticolae</i> -----	3.4
Mixed infestation-----	22.8

Tree selection (Dunning's)

Class	Total no	Infested	% infested	Relation
	trees	2 yrs.	per year	to ave.
1	22	2	4.5	-
2	23	12	26.1	-
3	38	8	10.5	-
4	62	11	8.8	-
5	3	3	50.0	-
6	2	2	50.0	-
7	4	4	50.0	-

Diameter Selection

D.B.H.	Total no	Infested	% infested	Relation
	trees	2 yrs.	per year	to ave.
12	5	5	50.0	-
14	14	4	14.3	-
16	5	5	50.0	-
18	20	9	22.5	-
20	14	4	14.3	-
22	15	5	16.6	-
24	26	5	9.6	-
26	32	2	3.1	-
28	22	2	4.5	-
30	1	1	50.0	-

TRAVERSE # 6 CUTOVER AREA

Acreage Cruised - 20 acres

Location - 45 N, R 2 E, Sec. 26. Strip 20 chains long, 10 chains wide in S.S.H.

Ownership - Government

Date of Logging -

Method of logging -

Site class -5

Type - Ponderosa pine

Reproduction - absent.

Percent estimate - Green Cruise - 10%, Insect losses, ±100%.

Record of stand and losses..

	20 Acre area		per acre.	
	trees	volume b.m.	Trees	volume b.m.
Stand at end of 1931	100	102,690	8	5,135
1932-1933 losses	19	9,510	0.9	476
% loss 1932-1933	11.9	9.3		
Loss per year	5.9%	4.7%		238
Composition of infestation (% of volume)				
D. brevicornis	62.7			
Melanophila spp.	36.0			
D. monticolae	0.4			

Tree selections (Dunning's)

Class	Total no trees	Infested 2 yrs.	% infested per year	Relation to ave.
1	20	0	0.0	-
2	46	6	6.3	-
3	21	1	2.4	-
4	15	5	16.6	-
5	56	5	4.4	-
6	1	1	30.0	-
7	1	1	50.0	-

Diameter selection

D.B.H.	Total no trees	Infested 2 yrs.	% infested per year	Relation to ave.
12	5	5	50.0	-
14	10	0	0.0	-
16	2	2	50.0	-
18	21	1	2.4	-
20	12	2	8.3	-
22	21	1	2.4	-
24	31	1	1.6	-
26	11	2	4.5	-
28	13	3	11.5	-
30	2	2	25.0	-
32	20	0	0.0	-
34	2	2	50.0	-
36	10	0	0.0	-

CUTOVER TRAVERSSES 2,3,4,5,6, CUTOVER AREAS.

Acreage - 180 acres

	120 acres	per acre	Trees volume <sup>b</sup>
Stand at end of 1931			
Stand at end of 1931	1,471 613,040	13.3 5,109	
1932-1933 losses	187 68,620	1.6 572	
% losses, per year	12.7 11.2		
Losses, per year	6.8% 5.6%		286

Composition of infestation (% of volume)

D. brevicornis	57.6
Melanophila spp.	27.2
D. Monticola	6.2
Ips emarginatus	0.9
Mixed infestation	8.3
Unknown cause of death	0.7

Tree Selection ( Danning's )

Class	Total No	Infested trees	% Infected per year	Relation to ave.
1	109	7	3.2	
2	563	75	6.5	
3	244	24	4.9	
4	283	32	6.5	
5	101	10	9.4	
6	43	13	15.1	
7	29	17	29.3	

Diameter selection

D.B.H.	Total no	Infested trees	% infested per year.	Relation to ave.
12	188	26	6.9	
14	108	24	11.1	
16	148	26	6.9	
18	225	22	4.9	
20	217	27	5.2	
22	188	16	4.2	
24	115	14	6.1	
26	71	10	7.0	
28	102	12	5.9	
30	35	2	4.3	
32	53	3	5.7	
34	14	4	14.3	
36	21	1	2.4	

TRAVERSE #7 VIRGIN STAND

Acreage Cruised - 80 Acres

Location - T. 44 N., R. 2 E., Sec. 8, Ten chain strip running one mile north from approximate  $\frac{1}{4}$  corner between secs. 8 and 17.

Ownership -

Date logged - not logged.

Method of cutting

Site Class - 5

Type - Pure ponderosa pine - Some incense cedar and juniper.

Reproduction conditions. Little reproduction.

Percent estimated - Green cruise - 10 %. Insect losses - 100 %.

Record of stand and losses-

	80 Acre Area		Per acre.	
	Trees	Volume b.m.	Trees	Volume b.m.
Total Stand at end of 1951 season	2550	753290	320	9416
P.P.	1619	528,090	20.8	7351
I.C.	940	165200	11.8	2065
1952-1953				
losses	193	86,620	8.4	1083
% loss, 1952				
1952	11.0	14.7		
Loss per year	8.0%	7.4%		561

Composition of infestation (% of volume)

D. brevicomis-----85.1

Melanophila spp.---10.8

D. monticolae-----3.2

Mixed infestation--0.9

Tree Selection (Dunning's)

Class	Total no. trees	Infested 2 yrs.	% Infested		% Infested per year.	Relation to Ave.
			2 yrs.	2 yrs.		
1	100	0		0.0	0.0	-
2	478	48		9.4	5.7	-
3	15	14		93.3	48.7	<del>+</del> & <del>+</del>
4	393	30		7.7	3.8	+
5	264	54		20.5	10.2	+
6	92	12		13.0	6.5	+
7	269	37		13.8	6.9	+

Diameter selection.

D.B.H.	Total no. trees	Infested 2 yrs.	% Infested		% Infested per year.	Relation to Ave.
			2 yrs.	2 yrs.		
12	135	15		11.1	5.5	-
14	112	12		10.7	5.3	-
16	192	21		10.9	5.4	-
18	257	35		13.6	6.8	+
20	220	30		13.6	6.8	+
22	232	12		5.2	2.6	-
24	196	15		7.7	3.6	-
26	111	19		17.1	8.5	+
28	49	19		38.8	19.4	+
30	57	7		12.3	6.9	-

TRAVERSE # 7 VIRGIN STAND (con.)

Diameter selection.

D.B.H.	Total no trees	Infested 2 yrs.	% Infested 2 yrs.	% Infested per year.	Relation to Ave.
38	34	4	11.8	50.0	-
34	21	1	4.8	2.4	-
36	1	1	100.0	50.0	-
38					
40	8	2	100.0	50.0	+

TRAVERSE # 8. VIRGIN STAND.

Acreage Cruised- 80

Location - T. 44 N., R 1 E., Secs. 36 & 1. T. 44 and 45 N., R 2 E Secs. 31 and 6 & 45. A mile strip ten chains wide.

Ownership -

Site Class - 4 and 5

Type - Pure ponderosa pine. Some intense Cedar and Juniper

Reproduction - Scattered and sparse.

Percent estimate - Green Cruise 10 % Insect losses - 100 %.

Record of stand and losses.

	80 Acre Area.		per acre.
	Trees.	Volume b.m.	Trees Volume b.m.
Stand at end of 1931 total	2043	897,060	25.5 11,213
Ponderosa pine	1993	877,980	24.9 10,975
Incense cedar.	50	19,100	0.7 238
1932-1933 losses	224	115,850	2.8 1,440
% loss 1932-1933	11.4	13.2	
Loss per year	5.7 %	6.6 %	724

Composition of infestation ( % of volume)

D. <u>brevicornis</u>	71.2
Melanophila spp.	13.8
D. <u>monticolae</u>	0.9
Ips <u>emarginatus</u>	8.0
Mixed infestation	8.0
Unknown cause of death	0.1

Tree Selection ( Dunning's )				
Class	Total no trees	Infested 2 yrs.	% Infested per year	Relation to Ave.
1	190	9	2.3	-
2	690	60	6.5	+
3	36	15	20.6	+
4	518	52	8.2	+
5	426	46	5.4	-
6	96	15	8.3	+
7	237	26	5.5	-

Diameter Selection				
D.B.H.	Total no trees	Infested 2 yrs.	Total per yr.	Relation to Ave.
12	117	17	7.2	+
14	271	20	3.7	-
15	227	27	5.9	+
18	300	28	4.6	-
20	282	21	3.7	-
22	202	19	4.7	-
24	157	26	8.3	+
26	117	16	6.8	+
28	84	24	14.3	+
30	131	11	4.8	-
32	34	4	5.9	+
34	34	4	5.9	-

TRAVERSE # 8. VIRGIN STAND. (con.)

Diameter Selection

D.B.H.	Total trees	Infested 2 yrs.	% Total per yr.	Relation to Ave.
39	12	2	6.3	+
48	1	1	50.0	+

AVERAGES - TRAVERSES 1,7 and 8. VIRGIN STANDS.

Average - 200, Site class V, Timber type - Ponderosa pine

	200 acres			per acre
	trees	volume b.m.	trees	volume b.m.
Stand at end	4844	1,762,390	23.2	8,633
1932-1933 losses	477	232,710	2.4	1,164
% loss 1932-1933	10.3	13.2		
Loss per year	5.1 %	6.6 %		555

Composition of infestation (% of volume)

<u>D. brevicornis</u>	76.8
<u>Melanophila spp.</u>	14.7
<u>D. monticola</u>	1.0
<u>Ips emarginatus</u>	0.5
Mixed infestation	6.2
Unknown cause of death	0.1

Tree selection ( Dunning's )

Class	Total no trees	Infested 2 yrs.	% Infested per year.	Relation to Ave.
1	394	13	1.6	-
2	1751	128	3.6	-
3	214	32	7.3	+
4	756	88	5.8	+
5	783	113	7.2	+
6	289	74	5.3	+
7	517	74	7.1	+

D.B.H.	Total no trees	Infested 2 yrs.	% Infested per year.	Relation to Ave.
12	513	43	4.2	-
14	476	35	3.7	-
16	556	54	4.8	-
18	681	67	4.9	-
20	571	59	5.1	+
22	535	32	3.0	-
24	457	45	4.9	-
26	272	59	7.1	+
28	166	46	13.8	+
30	190	20	5.3	+
32	84	14	8.3	+
34	88	8	4.5	-
36	36	6	8.3	+
38	14	4	14.3	+
40	3	3	50.0	+
42	1	1	50.0	+
48	1	1	50.0	+

TRAILER # 1 VIRGIN STAB D

Acreage cruised- 40

Location - T. 45 N., R 2 E., Sec. 15. Strip 10 chains wide, 40 chains long in NNE and SSW

Ownership - Government

Date Logged -

Method of cutting -

Site Class - 5

Type - Pure ponderosa pine ( Marginal stand ) Few juniper in the area.

Reproduction conditions - Poor, few groups in more favorable localities.

Percent estimate - Green Cruise - 10 %, Insect Losses \* 100 %.

Record of stand and losses

Stand	40 Acre Area		Per Acre	
	Trees	Volume b.m.	Trees	Volume b.m.
Stand at end of 1932 season	1052	296,340	25.8	7,409
1932-1933 losses	60	30,240	1.5	756
% loss 1932	5.8	1052	.8	326
1933	2.9%	5.1 %	3	378
Loss per year				

Composition of infestation (% of volume)

<u>D. brevicornis</u>	60.0
<u>Melanophila spp.</u>	36.7
<u>D. monticolae</u>	5.0
Mixed infestation	8.3

Tree selection (Dunning's)

Class	Total no trees	Infested 2 yrs.	% Infested 2 yrs.	Relation to Ave.	
				to Ave.	
1	104	4	1.9		-
2	374	22	5.9		-
3	163	3	1.9		-
4	45	6	13.3	▲	
5	93	13	14.0	▲	
6	41	1	2.4	-	
7	11	11	100.0	◆	

TRAVERSE ST. VIRGIN STAND (con.)

Diameter Selection

D.B.H.	Total no trees	Infested 2 yrs.	% Infested Relation to Ave. per year
13	261	11	3.1
14	93	3	1.6
16	137	6	2.8
18	134	4	1.6
20	69	8	5.8
22	101	1	0.5
24	104	4	1.9
26	44	4	4.5
28	53	3	4.5
30	2	2	50.0
32	16	6	12.5
34	33	3	4.5
36	11	1	4.5
38	8	2	50.0
40	1	1	50.0
42	1	1	50.0

1. Plot - C 0 # 1, Shasta National Forest.
2. Date of Examination - June 18-19, 1934.
3. Location - ~~SE1/4, SW1/4, S2/4, S3/4~~ Sec. 54, T. 45 N, R2 E,
4. Land classification - U.S. Gov't cutover, - 180 acres.
5. Plot is entirely surrounded by more heavily cut private timber.
6. Altitude - 4800 feet.
7. Timber type - Ponderosa pine. Site 5. (This is the Forest Service estimate of sale quality. We consider it nearly a site 4 area.)
8. Topography - Relatively level bench with no marked topographic features.
9. Soil - Light, volcanic soil of shallow depth. Occasional lava outcrops.
10. Brush cover - Purshia tridentata, an
11. Precipitating - The plot lies in the 5-10 inch rainfall zone of recent years and normal precipitation is probably in the vicinity of 12 inches per year. The nearest weather station, at Malin, Oregon, had a rainfall of 9.38 inches in 1935.
12. Logged by Long-Bell Lumber Co. in 1925.
13. Method of logging - Caterpillars and wheels.
14. Marking practice - light 1919 Government selection.
15. Brush disposal - brush piled and burned.
16. Gross timber estimates (Forest Service Records).

	160 Acres	Per acre	Percent
Original	2,263.16 M.	14,145 b.m.	100.00
Cut 1925	1,586.62 M	9,916 b.m.	70.1
Left	676.54 M	4,228 b.m.	29.9

All timber ponderosa pine

17. Cutover cruise
- 1927 Forest Service Cruise (net) 160 a Per a % tot. Vol. ave. acre  
Ponderosa pine trees 674,340 b.m. 4,214 b.m. 100.0 316
- 1934 Bureau Ent. Cruise reconstructed to as of beginning of 1932  
season Ponderosa pine 8191 545,060 3,410 100.0 249

18. Insect caused losses in pine reserve (Ponderosa pine.)

	per acre	
Stand at beginning of 1932 season	13.7 trees	3,410 b.m.
1932-1933 losses	0.73 trees	261 b.m.
Loss per year	0.338 trees	130 b.m.
% stand lost per year	2.62 % (trees)	3.82 % (vol.)
Increment per year	65 b.m.	1.91 % of st.
Net loss per year	65 b.m.	1.91 % of st.

19. Composition of infestation

Insect Species	% total infested volume
<u>D. brevicornis</u>	70.0
<u>Melanophila species</u>	20.2
<u>D. monticolae</u>	2.3
<u>Ips emarginatus</u>	0.2
Mixed infestation	7.3

20. Tree selection (Dunning's)

Class	Total trees	Total infested trees	% Infested per year	Relation to average loss
1	566	25	1.83	-
2	1105	43	1.84	-
3	37	7	9.45	+
4	234	24	5.12	+
5	84	4	2.38	-
6	139	19	6.83	+
7	26	6	11.53	+

## 21. Diameter selection

D.B.H.	Total trees	Total infested trees	% infested per year	Relation to average loss
12	596	16	1.36	—
14	146	15	5.13	+
16	214	19	3.03	+
18	586	16	2.07	—
20	529	19	2.44	—
22	190	9	2.36	—
24	94	14	7.44	+
26	45	5	5.55	+
28	36	6	8.33	+
30	64	4	5.12	+
32	20	0	0.00	—
34	21	1	2.38	—

## 22. Growth trends in reserve. See figure 7

## 23. Pole stands and losses (% estimate - Green Cruise 5 %, insect infested Poles 100 %)

## Beginning of 1922, Ponderosa Stand.

D.B.H.	Stand Ponderosa	Infested poles total	% Infested per year	Relation to average.
4	1174	24	1.02	+
6	1555	35	0.80	—
8	1188	18	0.75	—
10	807	17	1.05	+
Totals	4734	94	0.88	

## 24. Composition of infestation in poles.

Insect species	% total number infested poles.
<u>D. brevicornis</u>	11.9
<u>Melanophilia species</u>	72.6
<u>D. monticolae</u>	3.6
<u>Ips oregoni</u>	10.7
Mixed infestation	1.2

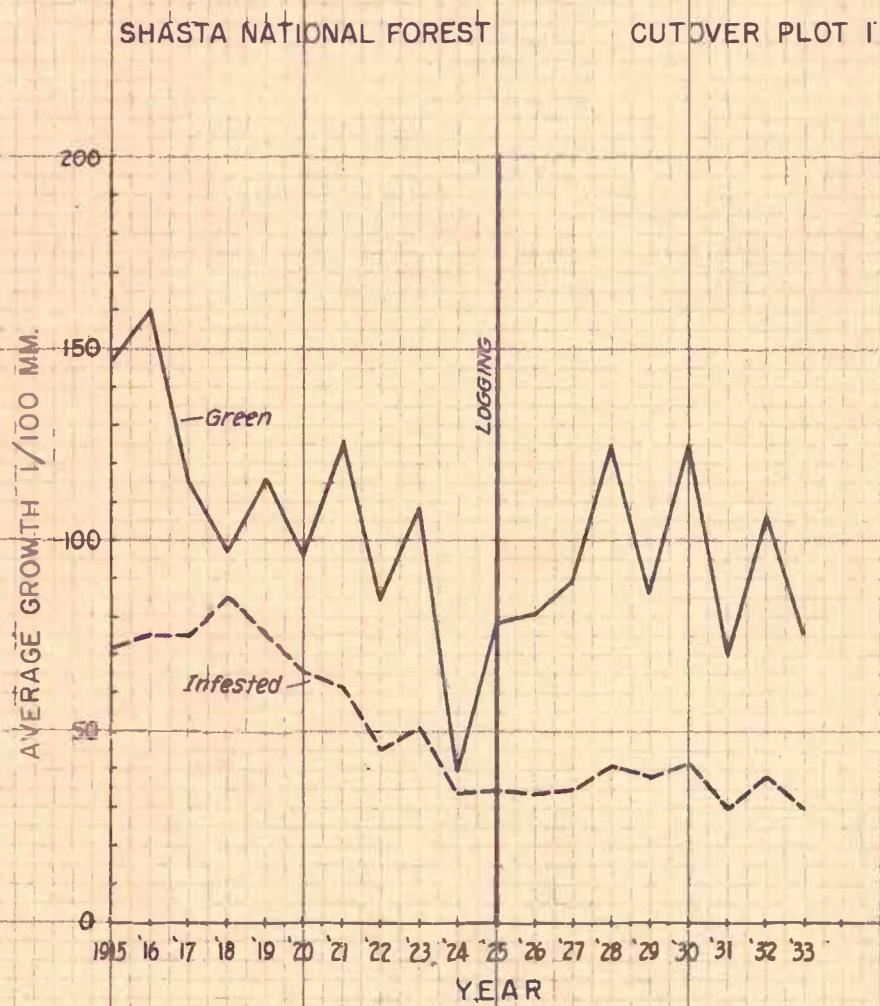
## 25. Reproduction conditions.

Based on 16/1/10 acre plots or 1 % cruise of total area.  
 0-6" 6"-3.5" Total Over 3.5"  
 Ponderosa pine 1.44 % 0.69 % 2.13 % 5.06 %

## 26. Infestation conditions in reproduction.

Primary injury appears to have been caused chiefly by browsing and porcupines. No primary insects were found attacking the trees although secondary species in the trees injured by the causes mentioned above.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE



1. Plot - CO # 2 - Shasta National Forest;
2. Date of examination - June 21, 1934.
3. Location - NWNW, SWNW, NSW, Sec. T 44 N, R 1 E M.D.M.
- 4 Land classification - Government cutover, 120 acres.
5. Sagebrush flat on west, private heavily cut areas on north, east and south.
6. Altitude, 4800 feet.
7. Timber type - Ponderosa pine Site 4.
8. Topography - Level to gently sloping to the west.
9. Soil conditions - Light volcanic soil of shallow to medium depth.
10. Brush cover - Artemesia tridentata, Chrysothamnus.
11. Precipitation - This plot lies in the 10-20 inch precipitation belt but, less than a mile to the north, timber shows evidences of a much greater rainfall deficiency. This is rather typical of the general region and indicates spotty precipitation. The nearest weather station is at Malin, Oregon, but it is doubted if the records are applicable.
12. Logged by Long-Bell Lumber Co. 1922.
13. Method of logging - G (In forest Service records the symbols were used. none knew their meaning) Logging probably with caterpillars.
14. Marking Practice - (C)
15. Brush disposal (A) - Probably piled and burned.
16. Gross estimated (Forest Service Records)

	120 Acres.	Per acre	%
Original	964.5 M.	8,037 b.m.	100.0
Cut	854.7 M	7, 122 b.m.	88.6
Left	109.8 M	915 b.m.	11.4

17. Cutover Cruise (10% estimate) (Forest Service 1925)	120 acres	Per acre	% total	Average tree vol.
Ponderosa pine	109.8 M	915 b.m.	100.0	258
(U.S. Bur. Ent. 1934 20 % cruise corrected to as of beginning of 1932 season)				
Ponderosa pine	147,890 b.m.	1,323 b.m.	100.0	204

18. Losses in pine reserve

	Per Acre.
Stand at beginning of 1932	6.03 trees
1932-1933 losses	0.08 trees
Loss per year	0.04 trees
% stand lost per year	0.66 % trees
Increment per year	21 b.m.
Net gain per year	2 b.m.

19. Composition of infestation.

Insect species	% total infested volume.
<u>D. brevicomis</u> -----	19.4 %
<u>Melanophila</u> species-----	73.9 %
Mixed infestation-----	6.7 %

20. Tree Selection (Dunning's)

Class	Total no	Total infested	% infested	Relation to Average loss.
	trees	trees	per yr.	
1	221	1	0.22	-
2	310	0	0.00	-
3	57	2	1.75	+
4	99	4	2.02	+
5	5	0	0.00	-
6	27	2	3.70	+

21

## 21 Diameter selection.

D.B.H.	Total trees	Total infested trees	% Infested per year	Relation to average loss.
12	210	0	0.00	-
14	70	0	0.00	-
16	106	1	0.47	-
18	91	1	0.54	-
20	72	2	1.38	+
22	51	1	0.28	+
24	25	0	0.00	-
26	54	4	3.70	+
28	20	0	0.00	-
30	5	0	0.00	-
32	16	0	0.00	-
34	10	0	0.00	-

## 22. Growth trends in reserve - See figure

## 23. Pole stands and losses

20 % Green Cruise - 100 % insect loss cruise

Stand at beginning of 1938, Ponderosa pine only.

D.B.H.	Lodgepole Pine	Juniper	Ponderosa Pine	Infested Poles	% Infested per yr.	Rel. to
4	5	150	501	31	3.09	+
6	---	90	604	24	1.98	+
8	---	15	513	8	0.77	-
10	5	20	398	3	0.37	-
Totals	10	265	2016	68	1683	

## 24. Composition of infestation in poles.

Insect species % total no infested poles.

Melanophila species ----- 92.4

Ips oregoni ----- 6.1

Mixed infestation ----- 1.5

## 25. Reproduction conditions

Based on 12 1/10 acre plots or 1 % cruise of total area.

Tree Species 0-6" 6'-5.5" Total Over 5.5".

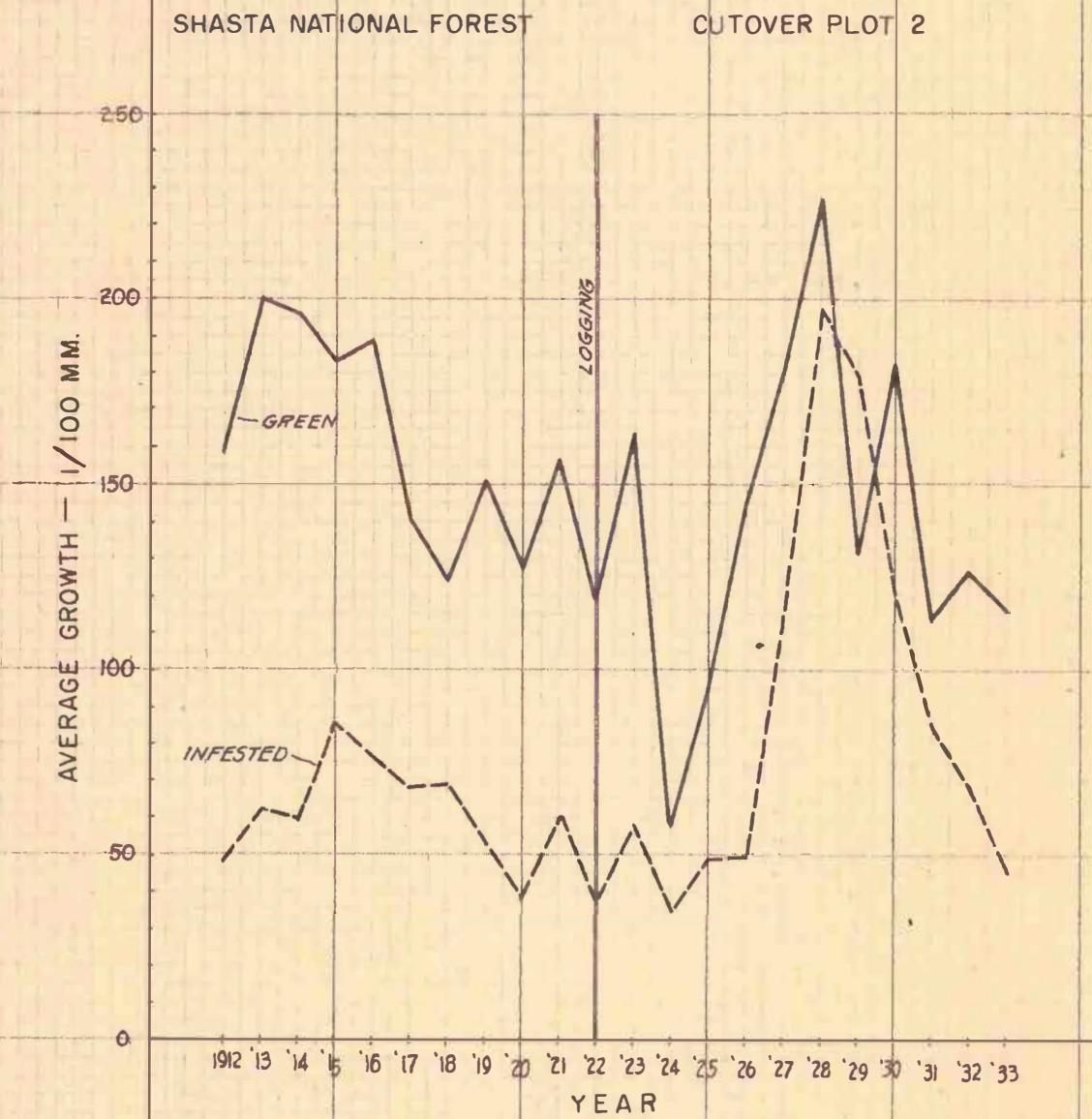
Ponderosa pine 0.57 % 0.16 % 0.83 %

Juniper 0.09 % 0.16 % 0.25 %

Totals 0.75 % 0.33 % 10.08 % 1.17 %

## 26. No primary insects were found infesting reproduction. Some injury from fire and browsing was noted.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE



1. Plot - C0 # 3 Shasta National Forest.
2. Date of examination - June 22, 1934.
3. Location - Section 29 and 32, T 44 N, R 1 E.
4. Land classification - Long Bell Crtover - 160 A.
5. Entirely surrounded by cutover lands of a similar nature.
6. Altitude - 4800 feet.
7. Timber type - Ponderosa pine site 4.
8. Topography - Level with no prominent topographic features.
9. Soil conditions - Light volcanic soil of moderate depth.
10. Brush cover - Artemesia tridentata, Purshia tridentata, Cercocarpus and Chrysothamnus.
11. Climate - Similar to Plot 3. Malin, Oregon records are not applicable although that is the nearest weather station.
12. Logged by Long Bell Lumber Co. 1922.
13. Method of logging - Caterpillar.
14. Marking practice - Economic selection.
15. Brush disposal - None.
16. Gross estimates.

Total 1918 original estimate - 11,250 b.m. per acre.

Cut about 12,617 b.m. per acre.

17. Cut over Cruise.

20 % estimate in 1934. Reconstructed to as of beginning of 1932 season.

Tree species	No.Trees	160 Acre Per acre	% Total volume	Ave. tree vol.
Ponderosa pine	656	48,780 b.m.	305	100.0
Juniper	40			74
Total	696	48,780 b.m.	305	100.0

18. Losses in pine reserve (ponderosa pine).

Per Acre.

Stand at beginning of 1932	4.1 trees	305 b.m.,
1932-1933 losses	.006	0.38 b.m.
Loss per year	.003	0.28 b.m.
% stand lost per year	.007	0.39 %
Increment per year	15 b.m.	4.98 % of stand.
Net gain per year	approximately as above	4899

19. Composition of infestation.

The single tree was killed by Melanophila species.

No other loss from any other cause.

20. Tree selection.

Class	Total no	Total infested	% infested per year.
	rees	rees	rees
1	160	1	0.11
2	446		
3	5		
4	0		
5	0		
6	35		
7	10		

21. Diameter selection

D.B.H. Total trees, Total infested % infested per year.

		rees	
12	320	1	0.7
14	71		
16	105		
18	110		00
20	35		
22	15		

22. Growth trend in reserve see figure #

23. Pole stands and losses.

Green cruise 20 %, Insect loss cruise 100 %.

D.B.H. Stand at beginning of 1938, Juniper Ponderosa Pine		Total infested poles	Infested per yr.	Relation to Ave.
4	45	1665	5	0.15 +
6	5	1720	5	0.14 +
8	15	876	3	0.17 +
10	15	476	1	0.10 -
Totals	80	4738	14	0.14

25. Reproduction conditions.

Based of 16, 1/10 acre plots of 1 % total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	4.3 %	2.1 %	6.4 %	
Juniper	0.1 %	0.1 %	6.5 %	
Totals	4.4 %	2.2 %	6.6 %	2.4 %

25. Infestation conditions in reproduction not caused by tri-

No marked injury in reproduction was caused by primary insects.

Heavy porcupine damage was found to occur on this plot.

## GROWTH OF GREEN PONDEROSA PINE

SHASTA NATIONAL FOREST

CUTOVER PLOT 3

AVERAGE GROWTH — 1/100 MM.

400  
350  
300  
250  
200  
150  
100

No Infested Cores

LOGGING

YEAR

1912 '13 '14 '15 '16 '17 '18 '19 '20 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33

1. CO # 4, Shasta National Forest.
2. Dates of examination - August 25, 26, 1925. (Person) June 11-15, 1934.
3. Location - Section 28, T 43 N, R 17 W, M.D.M.
4. Owner - U.S. Government, Trespass cutover by Long Bell Lumber co. 640 acres.
5. Condition of Management of surrounding timber - Entirely cutover or brush.
6. Altitude - 4800 feet.
7. Timber type - Ponderosa pine, Site 5.
8. Topography - The area is practically level with a few lava rock outcrops and slight elevations. Slight slope to northwest.
9. Soil conditions - Volcanic ash with lava outcrops. Soil is of medium to shallow depth.
10. Brush cover - Brushy in most parts. The abundant species are Ceanothus velutinus, Purshia tridentata and Arctostaphylos patula.
11. Climate - The nearest weather station is in Montague, about 16 miles distant. At that station a normal precipitation is about 12 inches. Stand conditions on the plot, however, would seem to indicate more severe moisture deficiency.
12. Logged by Long-Bell Lumber Company (Weed) in 1905.
13. Method of logging - Horses and wheels.
14. Marking practice - None. This is a trespass area and practically all trees over 12 inches were taken. (Person).
15. Gross timber estimates.

Forest Service.

	640 Acres	Per acre Percent.
Original estimate	7,217.5 m.b.m.	11,277 b.m. 100.0
Original estimate	6,500 m.b.m (1905)	10,156 b.m. 90.1
Cut	717.5 m.b.m. (1925)	1,121 9.9
Left		

Only ponderosa pine occurs on the area, no other species having appeared in any of the cutover cruises.

q

16. Brush disposal - none.
17. Cutover cruises - 10 % estimates. 640 acres per acre % tot. Ave. tree Net stand, 1925.

Goldsmith and Kellogg

	593, 280, b.m.	927 b.m. 100.0	190 b.m.
Person from Forest Service.	710, 400 b.m.	1,110 b.m. 100.0	
Net stand, beginning of 1932.			
Reconstructed from Bureau of Ent. Cruise 1934.	567, 910 b.m.	887 b.m. 100.0	187 b.m.

## 18. Losses in pine reserve (Ponderosa pine only)

1925 figures

Per Acre.

Stand in 1925

Goldsmith and Kellogg	4.88 trees	927 b.m.
Person from Forest Service		1,110 b.m.
1924-1925 losses (Person)	0.28	63 b.m.
1926-1927 losses (Person)	0.35 trees	97 b.m.
Loss per year in reserve (Person)		
1924-1925	1.	0.14 trees
1926-1927		0.17 trees
% stand lost per year per acre.		
Goldsmith and Kellogg		
1924-1925	2.86 %	2.86 % (trees) 3.34 % (b.m.)
1926-1927		3.48 % (trees) 5.17 % (b.m.)
Person from Forest Service.		
1924-1925		2.79 % (b.m.)
1926-1927		4.32 % (b.m.)
Increment per year per acre (Person)	6.6 b.m.	0.71 % stand (G & K) 0.59 % stand (Person)
Net loss per year per acre		
1924-1925	34.4 b.m.	2.62 % stand (G & K) 2.19 % stand (Person)
1926-1927	41.4 b.m.	4.46 % stand (G & K) 3.73 % stand (Person)

## 1934 cruise figures.

Stand at begining of 1932 season.	4.75 trees	897 b.m.
1932-1933 losses	1006 trees	211. b.m.
Loss per year	0.53 trees	105 b.m.
% stand lost per year	11.15 % trees	11.83 % (b.m.)
Increment per year	16.4 b.m.	1.85 % of stand
Net loss per year	38.6 b.m.	9.99 % of stand

## 19. Composition of infestation

Insect species	% total volume infested.
<u>Dendroctonus brevicomis</u>	30.6
<u>Melanophila species</u>	31.3
<u>Dendroctonus monticolae</u>	2.8
Mixed infestations	4.7
Unknown cause of death	0.3

1932-1933 windthrows filled in with Melanophila to the extent of 32 trees and 7,340 b.m.

## 20. Tree selection (Dunning's)

Class	Total trees	Total infested trees	% infested per yr.	Relation to ave. loss
1	756	78	5.03	-
2	1341	310	11.53	+
3	192	96	55.00	+
4	242	86	17.76	+
5	18	18	50.00	+
6	530	57	8.63	-
7	158	35	11.07	-
8				

## 21. Diameter Selection.

D.B.H.	Total trees	Total infested trees	% infested per yr.	Relation to ave. loss.
12	470	114	12.13	+
14	391	99	12.65	+
16	490	105	10.71	-
18	561	125	11.14	-
20	48	100	10.37	-
22	35	61	8.49	-
24	152	55	18.09	+
26	87	15	8.63	-
28	43	2	2.32	-
30	2	2	50.00	+

## 22. Growth trends. See figure #

22. (con.)

23. Pole stands and losses.

Basis - Green Cruise - 10 %, Lesser losses - 100 %.

D.B.H.	Stand at beginning of 1932	Total infested poles	% loss per year	Relation to average
4"	1000	56	8.8	+
6"	665	95	8.5	+
8"	539	117	11.7	+
10"	400	70	8.7	+
Total and Averages.	2476	338	8.8	

24. Composition of infestation in poles.

Insect species % total no. infested trees.

<u>D. brevicornis</u>	8.9
<u>Melanophila spp.</u>	74.9
<u>D. monticolae</u>	3.3
<u>Ips oregoni</u>	3.8
Mixed infestation	1.8
Unknown cause of death	1.1

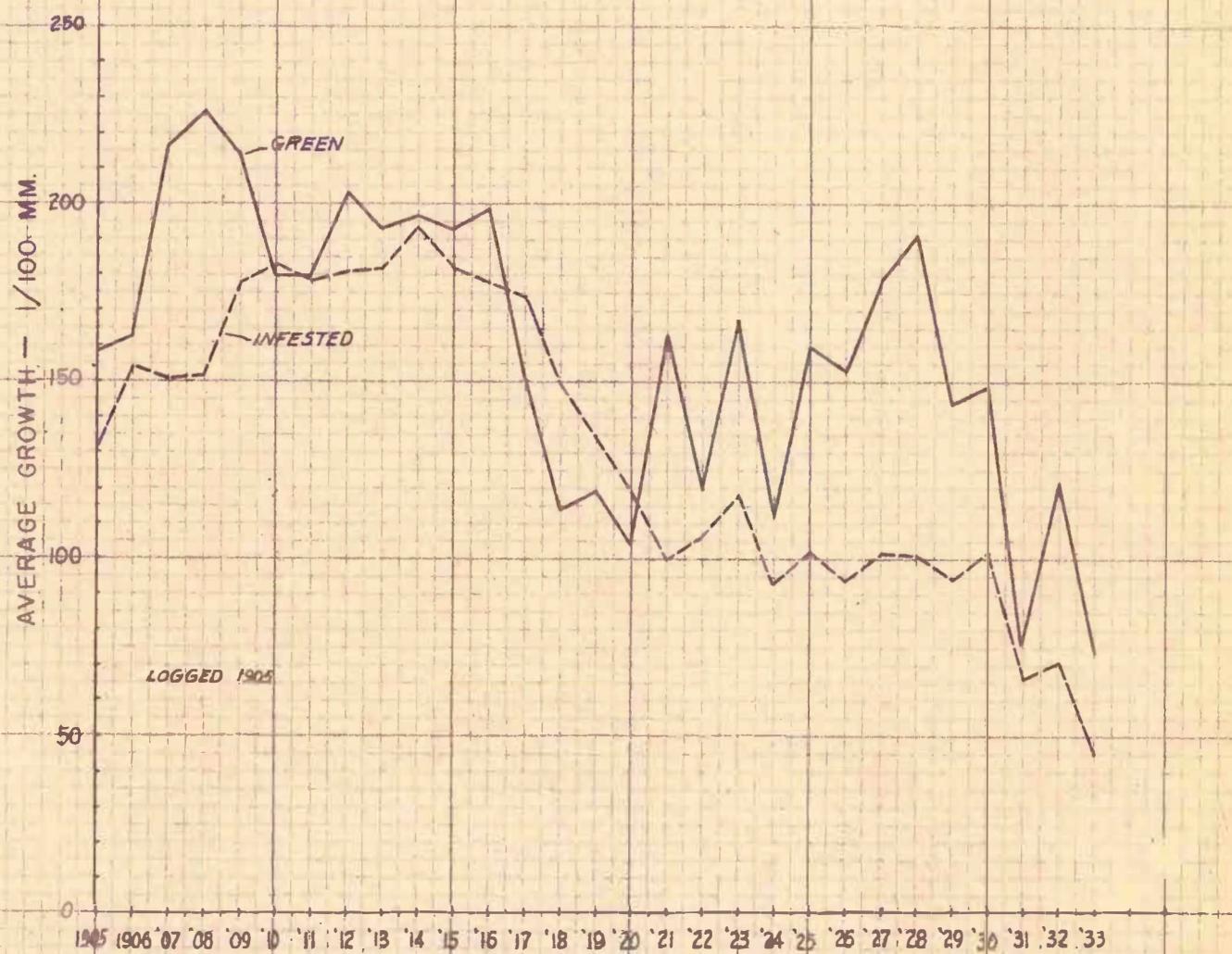
25. Reproduction conditions.

Observations showed practically no reproduction on the entire plot. As a result no attempt was made to determine stocking.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE

SHASTA NATIONAL FOREST

CUTOVER PLOT 4



1. CO. # 5 Modoc National Forest
2. June 6-9, 1934.
3. E  $\frac{1}{2}$  section 20, T 43 N, R 5 E.
4. Land classification - cutover. Owner - Long-Bell Lumber Co. 320 Acres.
5. Entirely surrounded by similar cutover.
6. About 4600 feet.
7. Timber type - Ponderosa pine site 4. The original stand was open and park-like, the majority of the trees being overmature. Classified as a mixed age stand. Some incense cedar, white fir and a very small amount of sugar pine.
8. Topography - Fairly gentle slope to east except in western portion in which slopes are steep to the east. The southern half of the plot is fairly level while the northern half is broken up by low ridges with a few lava outcrops and rims.
9. Soil conditions - Volcanic in origin having a top layer of loose pumice underlain by a shallow layer of red volcanic ash. Below this is lava rock. The soil is loose and friable but is not deep.
10. Brush cover - Brush species Ceanothus velutinus, Purshia tridentata, and Arctostaphylos patula predominate in patches.
11. Precipitation - The plot lies in the 10-15 inch rain belt of California and records from Hackmore for 1932 show 11.84 and 14.48 inches respectively for the two years. Alturas has a mean of about 12 inches per year, which is probably below that which falls in the vicinity of the plot. It has been noted storms occur in this area when other nearby areas receive no precipitation.
12. Logged by LongBell Lumber Co., 1930.
13. Method of logging - Caterpillars.
14. Marking practice - Economic selection system.
15. Brush disposal - no brush disposal: tops not lopped.
16. Gross timber estimates.

	320 Acres	Per acre	Percent
Original	6,275 M - 1926	19,609 b.m.	100.0
Cut	5,547 M - 1930	17,334 b.m.	88.4
Left	728 M - 1930	2,275 b.m.	11.6

No separation of volume in the different tree species has been made in the above figures.

17. Cutover Cruise - 10 % estimate.

(Reconstructed from 1934 cruise for as of beginning of 1931 season)					
Tree Species	No Trees	320 Acres	Per acre	Tot. Vol.	Vol.
Ponderosa pine	2728	320,450 b.m.	1,055 b.m.	25.9	124
Incense Cedar	760	417,000 b.m.	1,303 b.m.	44.3	549
White fir	210	186,100 b.m.	582 b.m.	19.8	886
Totals	3698	940,550 b.m.	2,940 b.m.	100.0	

No sugar pine above 12" d.b.h. found in the 10 % cruise.

18. Losses in pine reserve. m (Ponderosa pine)

	Per Acre.
Stand at beginning of 1931 season	8.5 trees 1,055 b.m.
1931-1933 losses	0.26 trees 35 b.m.
Loss per year	0.13 trees 11 b.m.
% stand lost per year	1.00% (trees) 1.04% (b.m.)
Increment per year	23 b.m. 2.18% of stand.
Net gain per year per acre	18 b.m. 1.14% of stand.

19. Composition of infestation.

Insect Species	% total infested volume.
<u>D. brevicornis</u>	52.0
<u>Melanophila species</u>	31.9
<u>D. monticolae</u>	2.6
<u>Ips oregoni</u>	9.4
Mixed infestations	9.5
Unknown cause of death	3.6

Windthrows and trees cut for road filled in with various species of insects to the extent of 12 trees and 1,420 b.m. (not included)

20. Tree selection (Dunning's)

Class	Total trees	Total infested trees	% infested per year	Relation to average loss.
1	125	3	0.80	-
2	1019	16	0.58	-
3	83	2	0.80	-
4	1085	30	0.92	-
5	87	6	2.29	+
6	31	1	1.07	+
7	293	24	2.68	+

21. Diameter selection.

D.B.H.	Total trees	Total infested trees	% infested per year	Relation to average loss.
12	563	22	1.30	+
14	537	20	1.24	+
16	565	26	1.53	+
18	567	12	0.27	-
20	304	2	0.22	-
22	131	0	0.00	-
24	51	0	0.00	-
26	10	0	0.00	-
28				

22. Growth trends in reserve. See figure #

23. Pole stands and losses (percent estimate 5% cruise, 100% insect losses).

D.B.H. Stand at beginning of 1931 season	Total infested trees	% infested per year	Relation to average loss.
4	1698	12	0.21
6	1142	17	0.49
8	605	22	1.21
10	421	10	1.54
Totals	4066	62	0.56
			Average.

24. Composition of infestation in poles.

Insect species	% total no. infested poles.
<u>D. brevicornis</u>	11.76
<u>Melanophila species</u>	50.00
<u>D. monticolae</u>	1.47
<u>Ips oregoni</u>	17.74
Mixed infestation	13.23
Unknown cause of death	5.88

24. Reproduction conditions.

Based on 32 1/10 acre plots. 1% cruise of total area.

Tree species		Size		
Ponderosa pine	0-5'	6'-5"	Total	Over 3.5"
Ponderosa pine	8.2 %	0.3 %	9.0 %	
Incense cedar	0.9	0.6	1.5	
White Fir	1.8	0.6	2.2	
Sugar Pine	T	T	T	
Totals	10.7	2.0	12.7	2.3

25. Infestation conditions in reproduction.

The chief injury to reproduction, besides an occasional plant infested by secondary species of insects was that caused by a species of tip moth, (*Phyaconia pasadenana*) (Kearf. Examination of reproduction plots showed its damage to be spread throughout the plot with slightly more abundant injury in the southern half, which is relatively flat.

Typical injury consists of excavation of the growing tips of terminals and laterals by the larva. The infested portion dies and growth of the tree must continue through other laterals of terminals unless adventitious buds are produced. This last occurrence is not common and, usually the effect of the attack is to deform the main stems or branches and reduce growth. Also many cedominant shoots may be formed in heavily infested specimens and in some cases all of these may be infested. Examination of the current year's growth of one specimen not over 18 inches in height showed nine separate cedominant terminal growth buds, eight of which had been infested this season. Evidence of previous infestation of other buds in other years was abundant and count of the rings at the base of the plant showed the tree to be at least 24 years old. As normal uninfested terminal growth in the near vicinity is from 4 to 7 inches per year, it appears that the tree should have been 8 feet or over in height. It is probable that the marked reduction in amount of growth is due, in a large part, to the effects of the tip moth infestation.

Counts to obtain the incidence of infestation were secured from random traverses. Reproduction of from 0 to 6 feet was found to bear the important infestation, larger material having but an occasional lateral affected. On the smaller material the following was shown by the counts.

Percent of all buds infested.

Height	No trees	No. infested	No. uninfested	Total no.	% total infested
0	counted	buds	buds	buds	infested
0-2'	66	232	277	509	45.5
2'-4'	22	25	155	180	14.0
4'-6'	22	19	380	349	5.4

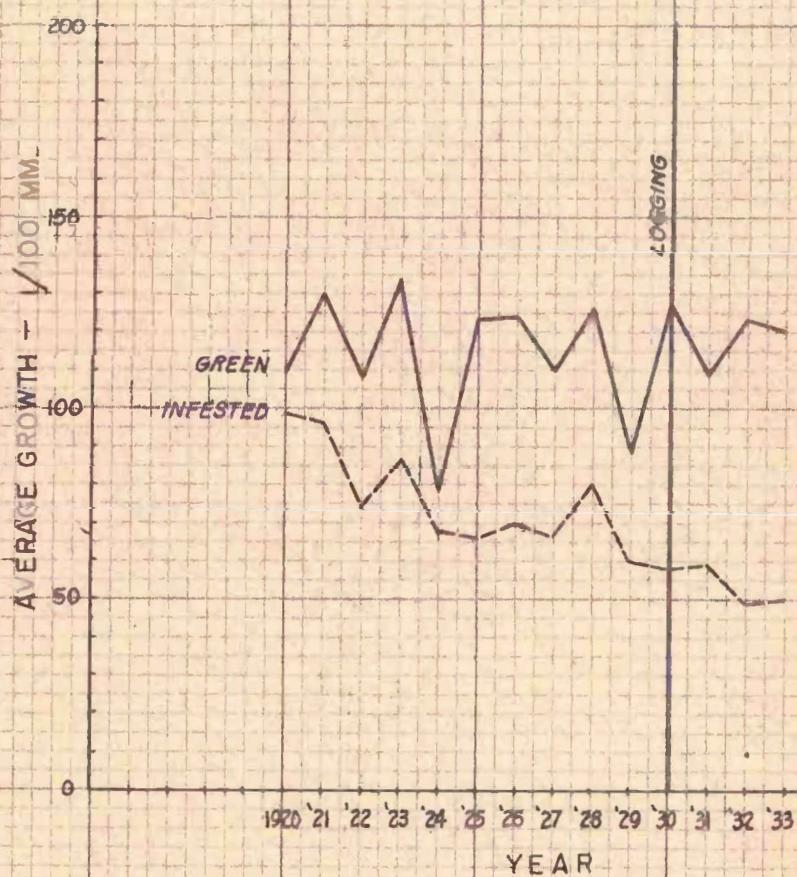
Examination to determine the percent of terminals infested showed the following figures.

0-4' high, 73 infested, 77 uninfested, 48.7 % infested.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE

MODOC NATIONAL FOREST

CUTOVER PLOT 5



1. Plot - CO # 6. Lassen National Forest.
2. Date of examination - July 9-11, 1934.
3. Location - S  $\frac{1}{2}$  section 36. T 33 N, R 9 E. N.B.M.
4. Land Classification - U.S. Government cutover, 320 acres.
5. Portions of northern half of section are uncut. Eastern, southern and western boundaries are cut under a similar system of marking.
6. Altitude - 5750 feet.
7. Timber type - Ponderosa pine, site 4.
8. Topography - Characterized by a relatively steep slope on the southern portion and a more gradual slope in the northern. Aspect is northern and lava outcrops and fissures are characteristic.
9. Soil conditions - Well drained rocky soil of volcanic origin. Rather shallow in depth.
10. Brush cover - Cercocarpus, Artemesia, Ceanothus.
11. Climate - The plot lies in the 10-20 inch belt of rainfall, probably near the upper limit. There are no nearby year long weather stations having records of comparable climate.
12. Logged by Fruit Grower's Supply Co. in 1929.
13. Method of logging - Caterpillars.
14. Marking practice - Forest Service Selection.
15. Gross timber estimates. Cutover cruise of 1929.
16. Brush disposal - Piled and burned.

( 320 Acres in plot - Forest Service cruise of 1915)

	320 Acres	Per Acre	Percent
Original			
Ponderosa pine	3,544 MFM	11.075 b.m.	84.4
Sugar pine	-----	-----	-----
Incense Cedar	53 MFM	165 b.m.	1.3
White Fir	601 MFM	1,878 b.m.	14.3
Total	4,198 MFM	13,119 b.m.	100.0
Out (640 acres)			
Ponderosa pine	3,198.3 MFM	9.989 b.m.	88.9
Sugar pine	16.1 MFM	49 b.m.	0.4
Incense Cedar	45.9 MFM	144 b.m.	1.3
White Fir	318.1 MFM	944 b.m.	8.8
Unmerchantable			
all species	20.1	63 b.m.	0.8
Totals	3,593.6 MFM	11,236 b.m.	100.0
Left 1929			
Ponderosa Pine	764.6 MFM	2,389 b.m.	73.7
Sugar Pine	3.0 MFM	0 b.m.	0.3
Incense Cedar	11.4 MFM	36 b.m.	1.1
White Fir	258.4 MFM	808 b.m.	24.9
Total	1,037.4 MFM	3,242 b.m.	100.0

17. Cutover cruise.

10 % cruise of green trees, reconstructed for as of beginning of 1932 season. Cruise made in 1934.

Tree species	Trees	320 acres	per acre	% Total	Ave tree Vol.
--------------	-------	-----------	----------	---------	---------------

# 17. Cutover cruise (con.)					
Tree Species	Trees	320 Acres	Per Acre	% Total	Ave. tree Vol.
Ponderosa pine	2744	875,360 b.m.	2,736 b.m.	71.6	317
Jeffrey pine	90	27,300 b.m.	85 b.m.	2.2	304
Sugar pine	30	8,000 b.m.	25 b.m.	0.7	267
Incones cedar	110	14,300 b.m.	45 b.m.	1.2	130
White fir	1040	297,000 b.m.	928 b.m.	24.3	286
Totals	4014	1,221,960 b.m.	3,819 b.m.	100.0	

18. Losses in pine reserve.

Ponderosa pine	Per acre
Stand at beginning	
of 1932	8.6 trees
1932-1933 losses	0.06 trees
Loss per year	0.03 trees
% stand lost per year	0.03 % (trees)
Increment per year	44.6 b.m.
Net gain per year	39 b.m.

19. Composition of infestation

Insect species	% total infested volume.
D. brevicornis	11.6 %
Melanophila species	10.5
D. monticolae	20.6
Ips oregoni	1.1
Mixed infestation	6.2

20. Tree selection (Dunning's)

Tree class	Total no.	Total infested		% infested per yr.	Relation to average loss
		trees	trees		
1	421	1		0.11	-
2	1332	11		0.41	+
3	261	1		0.19	-
4	598	5		0.41	+
5	21	0		0.00	-
6	20	0		0.00	-
7	91	1		0.54	+

21. Diameter Selection.

D.B.H.	Total no	Total Infested		% Infested Pre year	Relation to Average loss.
		Trees	Trees		
12	508	5		0.49	+
14	274	4		0.72	+
16	304	3		0.49	+
18	452	2		0.42	+
20	414	4		0.48	+
22	260	0		0.0	-
24	101	0		0.00	-
26	121	0		0.00	-
28	100	0		0.00	-
30	71	0		0.00	-
32	81	1		0.61	+
34	40	0		0.00	-
36	10	0		0.00	-
38	30	0		0.00	-

22. Growth trends in reserve (See figure # )

23. Pole stands and losses.

23. Pole stands and losses.

4	W.fir.	I.C.	S.P.	J.P.	P.P.	Total	% Infestation per year		Relation to ave loss
							(-----)	Ponderosa pine only	
4	1560	200	20	110	3122	2		0.03	-
6	1920	160	20	40	3896	6		0.07	-
8	1280	80	30	40	1673	3		0.08	+
10	930	70	10	30	1335	4		0.14	+
Totals	5690	510	80	220	10026	15		0.07	

No pole losses in pine species.

24. Composition of infestation in poles.

Insect species	% total no. of infested poles.
<u>Melanophila</u> species	40.0
<u>D. monticolae</u>	26.7
<u>Ips oregoni</u>	33.3

25. Reproduction conditions.

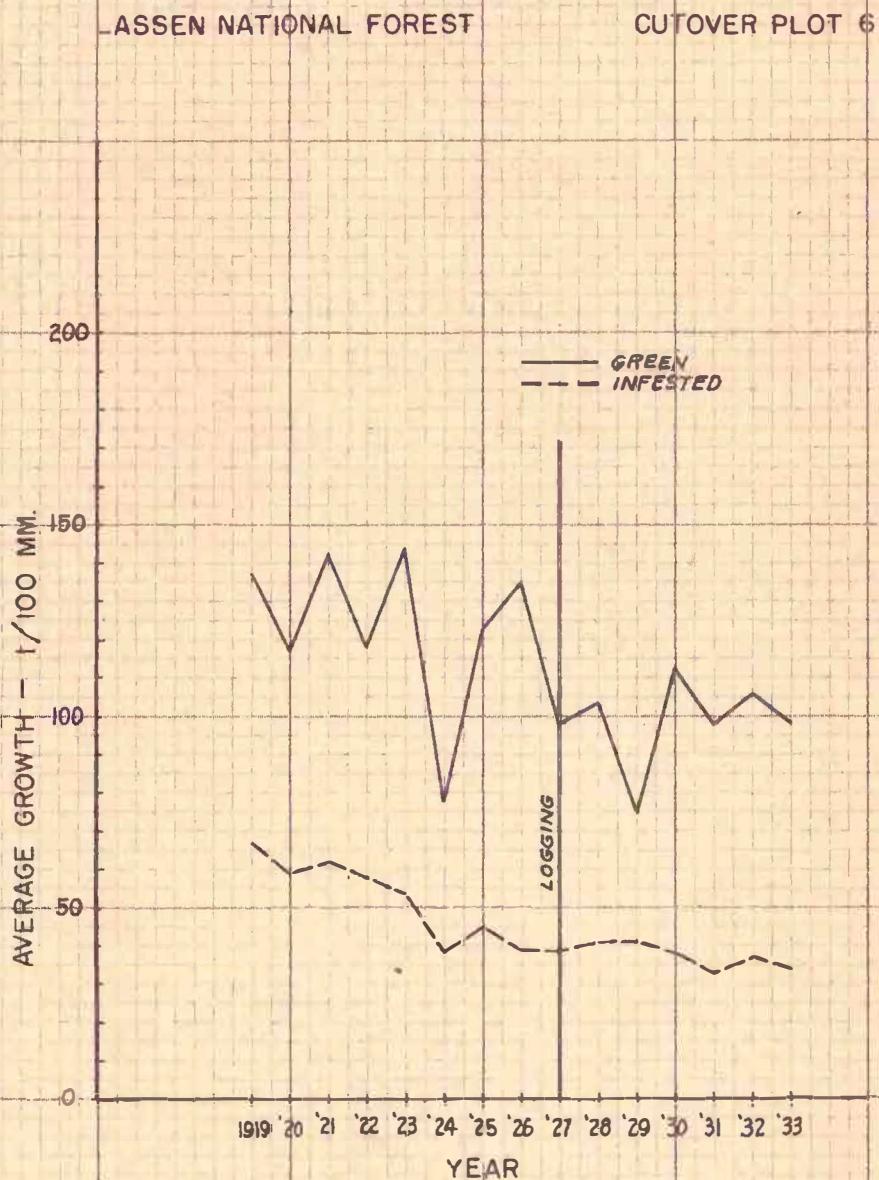
Based on 32 1/10 acre plots. 1 % cruise of total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	12.75 %	4.88 %	17.63 %	
Jeffrey pine	0.15 %	-----	0.15 %	
Sugar pine	0.31 %	0.09 %	0.40 %	
Incense cedar	0.47 %	0.13 %	0.60 %	
White fir	3.94 %	-----	-----	
Totals	14.62 %	6.72 %	24.34 %	6.59 %

26. Infestation conditions in reproduction.

No insect injury to pine reproduction, with the exception of a very few trees about 8 feet high infested by flathead borers, was noted on this plot.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE



1. C.O # 7, Lassen National Forest.
2. Date of examination - July 18 and 23, 1934.
3. Location - W  $\frac{1}{2}$  sec. 1, T 32 N, R 8 E, N.D.M.
4. Land classification - U.S. Government, cutover - 320 acres.
5. Surroundings - Similarly cutover lands.
6. Altitude - 5700 to 5900 feet.
7. Timber type - Ponderosa pine. Site 3. (I consider it Ponderosa pine type, except possibly in the southern end of plot.)
8. Topography - Moderate to steep slope having a northern aspect. North end is sage flat and lava rim. Extensive rough lava flows are present in the southern half of the plot.
9. Soil conditions - Volcanic in origin, shallow in depth, light and porous.
10. Brush cover - Artemesia tridentata, Arctostaphylos patula, Ceanothus velutinus.
11. Precipitation - No pertinent weather station record is available. The plot lies in the 10-20 inch rainfall belt, probably near its upper limit.
12. Logged by Fruit Growers Supply Company, 1930-1931.
13. Method of logging - Skidding by caterpillars, long hauls with big wheels.
14. Brush disposal - North  $\frac{1}{2}$  of plot fire lined. South  $\frac{1}{2}$  of plot piled and burned.
15. Marking practices - Regions 5 standard selection. Only decadent fir marked.
16. Gross timber estimated.

Original (Hodgin and Insign, 1914)

Ponderosa pine	4665 M.B.M.
White fir	484
Incense cedar	186
Total	5,335 M.B.M.
Cut (Approximately - scaled at mill)	
Ponderosa pine	4,877 M.B.M.
White fir	643
Incense cedar	31
Sugar pine	37
Total	5,588 M.B.M.
Left (Approximately - Edmonds et al, 1931 1932)	
Ponderosa pine	1,312 M.B.M.
Sugar pine	38
White fir	390
Incense cedar	3
Total	1,743 M.B.M.

Yearly increment for ponderosa pine calculated at 128 b.m. per acre or 3.12 %

17. Cutover cruise - Forest Service. N. Bureau of Entomology cruise made for this plot.

18. Lessee in pine reserve.

(Ponderosa pine only.)	Per Acre.
Stand at beginning of 1932	Approx. 4,100 b.m.
1932-1933 losses	0.04 trees 13.3 b.m.
Loss per year	0.02 trees 6.7 b.m.
% of stand lost per year	...
Increment per year	128 b.m. 3.12 % of stand
Net gain per year	121 b.m. Approx. 3.00 % of stand.

19. Composition of infestation.

Insect species	% total infested volume.
D. brevicornis	7.5
D. monticolae	1.9
Melanophila species	78.4
Mixed infestation	12.3

20. Tree selection - No data on green trees.  
 21. Diameter selection - No data on green trees.  
 22. Growth trends - No data.  
 23. Pole stands and losses - No data on green trees.  
 Infestation in ponderosa pine poles was found as follows.

D.B.H.	Total poles infested.
4	3
6	9
8	8
10	4

24. Composition of infestation in poles.

Insect species	% total number of infested poles.
<u>D. brevicornis</u>	8.3
<u>D. monticola</u>	8.3
<u>Melanophila species</u>	66.7
<u>Ips oregoni</u>	16.7

25. Reproduction conditions - No data.

26. Infestation conditions in reproduction.

Most of the ponderosa pine reproduction on this plot was found to be vigorous. However, a type of needle blight was found in several parts of the plot. Tender tips of the current years growth of white fir was found to have been injured, possibly by late spring frosts.

1. Plot - CO # 8, Lassen National Forest.
- 2 Date of examination - July 12-16, 1934.
3. Location - N  $\frac{1}{2}$  Section 23, T. 32 N, R 9 E.
4. Land Classification - U.S. Government cutover, 320 acres.
5. Surrounded by cutover lands having similar treatment.
6. Altitude 6250 feet.
7. Timber type - Ponderosa pine, Site 4.
- 8 Topographht - Entire plot has a southerly aspect and no pronounced topographic features. Besides the slope some few lava outcrops exist.
9. Soil conditions - Drainage good. Soil volcanic in origin, light and somewhat rocky. Of shallow to moderate depth.
10. Brush cover - Ceanothus sp., Arctostaphylos sp.
11. Precipitation - The plot lies in the 10-20 inch zone of precipitation, probably near the upper limit. There are no nearby weather stations furnishing pertinent records.
12. Logged by Fruit Grower's Supply Company - 1927-1928.
13. Method of logging - Caterpillars.
14. Marking Practice - Forest Service, Region 5, 1928 system.
15. Slash Disposal - Slash lopped and scattered. Protective fire lines constructed.
16. Gross timber estimates.

Forest Service Estimates 1915 and 1929.

Original (1915)	320 acre	Per acre	% stand.
Ponderosa pine	6,514 MBM	20, 356 b.m.	74.5
Sugar pine	242	756	2.8
Incense cedar	274	856	3.1
White fir	1,715	5,359	19.6
Totals	8,745 MBM	27,327 b.m.	100.0

Cut (1929)			
Ponderosa pine	4,025.3 m.b.m.	12,579 b.m.	77.5
Sugar pine	22.7	71	0.5
Incense cedar	225.5	705	4.3
White fir	920.4	2,876	17.7
Totals	5,194.0 m.b.m.	16,231 b.m.	100.0

Left (Forest Service Cruise 1928)			
Ponderosa pine	1,152.9 MBM	3,603 b.m.	63.7
Sugar pine	3.8	12	0.2
Incense cedar	67.5	211	3.7
White fir	378.6	1,831	32.4
Totals	1,602.8 MBM	5,657 b.m.	100.0

17. Cutover cruise (10 % estimate)

Tree species	Trees	320 acres	Per acre	% total		
				Ave tree	volume	volume
Ponderosa pine	1001	445,260 b.m.	1,391 b.m.	31.4	445 b.m.	
Jeffrey pine	1095	535,620	1,674	37.8	494	
Sugar pine	20	4,100	13	0.3	205	
Incense cedar	290	56,400	176	4.0	188	
White fir	730	576,000	1,175	26.5	217	
Totals	3136	1,417,380 b.m.	4,429 b.m.	100.0		

18. Losses in pine reserve.

Ponderosa pine reserve.

Stand at beginning of 1932 season

1932-1933 Losses

Loss per year

% stand lost per year

Increment per year

Net gain per year

Jeffrey pine reserve.

Stand at beginning of 1932 season

1932-1933 losses

Loss per year

% stand lost

Increment per year

Net gain per year

19. Composition of infestation.

Insect species

Ponderosa pine;

Mixed infestation

Jeffrey pine.

Melanophila species

Sugar pine.

No losses in this tree species.

20. Tree selection (Dunning's)

Class	Total no trees	Total infested trees	% infested per year	Relation to average loss.
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Ponderosa pine

1	129	0	0	-
2	350	0	0	-
3	230	0	0	-
4	210	0	0	-
5	1	1	50.0	+
6	0	0	0	-
7	20	0	0	-

Jeffrey pine

1	290	0	0	-
2	471	1	0.10	-
3	21	1	2.38	+
4	292	2	0.34	+
5	1	1	50.0	+
6	10	0	0	-
7	10	0	0	-

Sugar pine - no losses.

21. Diameter selection - Ponderosa pine.

D.B.H.	Total no trees	Total infested trees	% infested trees per yr.	Relation to average loss.
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12	280	0	0	-
14	70	0	0	-
16	120	0	0	-
18	60	0	0	-
20	50	0	0	-
22	70	0	0	-
24	60	0	0	-
26	71	1	0.70	+
28	70	0	0	-
30	60	0	0	-
32	40	0	0	-
36	10	46a	0	-
40	0	0	0	-

Diameter Selection - Jeffrey pine.

D.B.H.	Total no trees	Total infested trees	% infested per year.	Relation to average loss
12	261	1	0.19	-
14	110	0	0	-
16	130	0	0	-
18	81	1	0.81	+
20	81	1	0.60	+
22	71	1	0.70	+
24	31	1	1.61	+
26	50	0	0	-
28	50	0	0	-
30	30	0	0	-
32	30	0	0	-
34	80	0	0	-
36	50	0	0	-
38	20	0	0	-
40	20	0	0	-

22. Growth trends in reserve (See figure # )

23. Pole stands and losses (% estimate - 10% green cruise - Ponderosa pine only 100% losses)

D.B.H.	Tree species				Total in. poles	% inf. per yr.	Rel. to ave. loss
	White fir	Incense cedar	Sugar pine	Jeffrey Pine			
4	2670	310	---	810	1050	0	0
6	4310	410	---	1110	1980	0	0
8	1930	290	---	840	1050	0	0
10	1290	150	---	360	91	1	0.54

24. Composition of infestation in poles.

Ponderosa pine pole only infested - 100% Melanophila species.  
(1 Tree)

25. Reproduction conditions.

Based on 32 1/10 acre plots - 1% cruise of total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	2.41	2.31	2.72	
Jeffrey pine	1.53	0.88	2.41	
White fir	6.06	3.86	9.72	
Incense cedar	0.41	0.34	0.75	
Totals	10.41	7.19	17.60	8.59

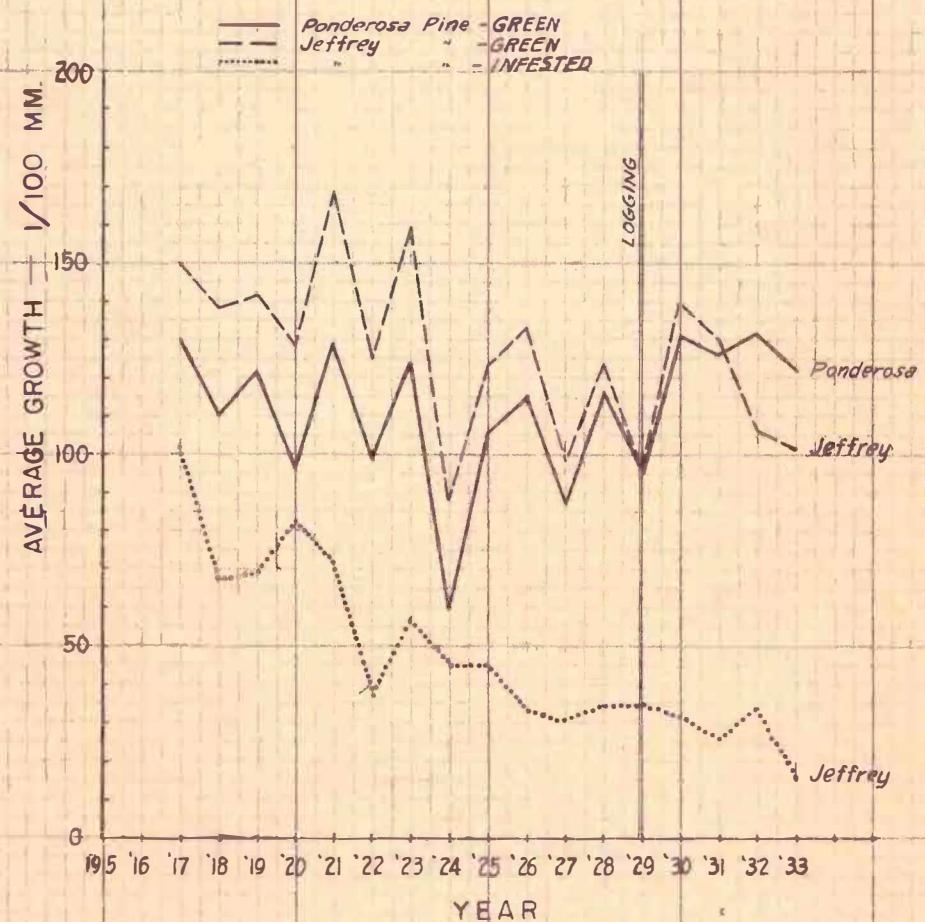
26. Infestation conditions in reproduction.

The sheath moth (Lepidoptera - family and species undetermined) was abundant on this area. However, its attacks are of secondary nature importance although they result in some reduction of growth. A few Jeffrey pine were killed by attacks of Ips cresoni and killing of new growth on white fir, possibly due to spring frosts, was prevalent.

## GROWTH OF GREEN AND INFESTED PONDEROSA AND JEFFREY PINE

LASSEN NATIONAL FOREST

CUTOVER PLOT 8



1. CO # 9, Lassen National Forest.
2. Date of Examination - July 26-28, 1934.
3. Location - S  $\frac{1}{2}$  section 14, T. 31 N, R 9 E, MDM.
4. Land Classification - U.S. Government cutover - 320 acres.
5. Entirely surrounded by lands cut on a similar basis.
6. Altitude - 6,000-6,100 feet.
7. Timber type- Ponderosa pine-site 3.
8. Topography - A relatively level area with several open flats and one fairly prominent rocky rim near the central portion of the plot.
9. Soil conditions - Light soil of moderate depth except on flats. Soil is of volcanic origin.
10. Brush cover - Ceanothus velutinus and C. prostratus.
11. Precipitation - No pertinent weather record exists. The general area lies in the 20-30 inch precipitation belt and, from indications, rainfall is fairly heavy.
12. Logged by Fruit Grower's Supply Company in 1922 and 1923.
13. Method of logging - Big wheels.
14. Marking practice.
15. Slash disposal.
16. Gross timber estimates.

Original estimates (Date unknown)				% stand.
Tree species	320 acres	Per acre		
Ponderosa pine	8,622 M.B.M.	26,944 b.m.		64.2
Sugar pine	-----	-----		-----
Lodgepole pine	140	438	1.1	
White fir	4,636	81	34.5	
Red fir	29	81	0.2	
Totals	13,427 M.B.M.	41,950 b.m.	100.0	
Cut 1922-1923.				
Ponderosa pine	4,988,040 b.m.	15,572 b.m.	56.1	
Sugar pine	29,220	91	0.3	
Lodgepole pine	197,230	616	2.2	
White fir	3,621,110	11,316	40.7	
Unmerchantable	62,540	195	0.7	
Totals	8,893,140	27,790	100.0	

17. Cutover Cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	320 acres	Per acre	% total	Average volume	tree vol.
Ponderosa pine	251	363,340 b.m.	1,135 b.m.	13.10	1448 b.m.	
Jeffrey pine	1063	871,110	2,722 b.m.	31.3	819	
Lodgepole pine	690	81,320	254	2.9	118	
White fir	3840	1,465,800	4,581	53.7	382	
Totals	5844	2,781,570	8,692	100.0		

18. Losses in pine reserve.

Ponderosa pine.	Per Acre.
Stand at beginning of 1932	0.78 trees 1135 b.m.
1932-1933 losses	0.003 trees 3.44 b.m.
Loss per year	0.002 trees 1.72 b.m.
% stand lost per year	0.020 % (trees) 0.15 % (b.m.)
Increment per year	17.91 b.m. 1.57 % of stand.
Net gain per year	16.19 b.m. 1.42 % of stand.

Jeffrey pine	Per Acre.
Stand at beginning of 1932	5.32 trees
1932-1933 losses	0.006 trees
Loss per year	0.003 trees
% stand lost per year	0.09 % (trees) 0.11 % (b.m.)
Increment per year	51.44 b.m.
Net gain per year	48.36 b.m.

19. Composition of infestation

Insect species % total infested volume.

Melanophila species Ponderosa pine 100. % (1 tree)

Melanophila species Jeffrey pine 64 % (1 tree)

Mixed infestation 36 % (1 tree)

20. Tree selection (Damning's)

Class	Total no		Total infested		% infested		Rel. to ave.	
	trees	per year	trees	per year	P.P.	J.P.	P.P.	J.P.
1	10	161	0	1	0	0.51	-	+
2	20	310	0	0	0	0	-	-
3	41	119	1	0	0.2	0	+	-
4	70	361	0	1	0	0.13	-	+
5	80	41	0	0	0	0	-	-
6	0	20	0	0	0	0	-	-
7	30	60	0	0	0	0	-	-

21. Diameter selection.

D.B.H.	Total no			Total infested			% infested		Rel. to ave.	
	P.P.	P.P.	J.P.	P.P.	J.P.	P.P.	P.P.	J.P.	P.P.	J.P.
12	10	100	0	0	0	0	0	0	-	-
14	20	100	0	0	0	0	0	0	-	-
16	0	60	0	0	0	0	0	0	-	-
18	10	90	0	0	0	0	0	0	-	-
20	20	100	0	0	0	0	0	0	-	-
22	50	140	0	0	0	0	0	0	-	-
24	0	60	0	0	0	0	0	0	-	-
26	0	50	0	0	0	0	0	0	-	-
28	20	51	0	1	0	0	0.98	0	-	+
30	21	40	1	0	2.50	0	0	0	+	-
32	50	62	0	1	0	0	0.80	0	+	-
34	20	70	0	0	0	0	0	0	-	-
36	20	40	0	0	0	0	0	0	-	-
38	0	60	0	0	0	0	0	0	-	-
40	30	10	0	0	0	0	0	0	-	-
42	0	20	0	0	0	0	0	0	-	-
44	0	10	0	0	0	0	0	0	-	-

22. Growth trends in reserve (see figure #)

23. Pole stands and losses (% estimate - 10 % green cruise - 100 % insect losses).

D.B.H.	White fir	Longepole pine	Ponderosa pine	Jeffrey pine	Infestation.
4	1860	380	10	150	
6	3210	590	70	300	
8	960	320	30	100	No insect losses found.
10	1560	410	40	60	
Totals	7610	1760	150	490	

24. Composition of infestation in poles.

No pine poles found infested.

25. Reproduction conditions.

Based on 32 1-10 acre plots - 1 % cruise of total area.

Three species	0-6"	6"-3.5"	Total	Over 3.5"
Ponderosa pine	0.50	0.06	0.56	
Jeffrey pine	2.19	0.25	2.44	
Lodgepole pine	1.84	1.31	3.15	
White fir.	3.56	1.25	4.81	
Totals.	8.09	2.87	10.96	7.28

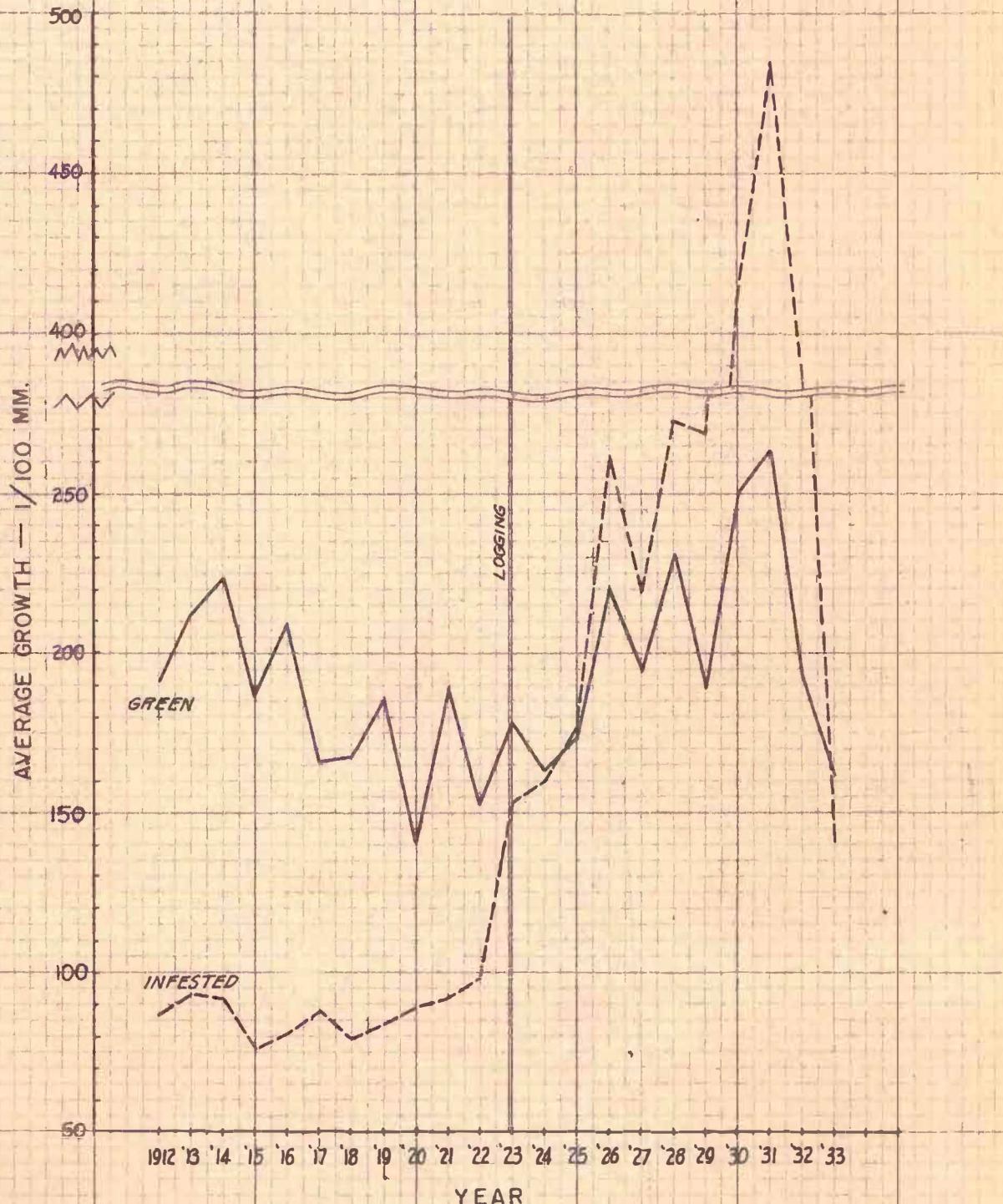
26. Infestation conditions in reproduction.

No insect injury found.

# GROWTH OF GREEN AND INFESTED JEFFREY PINE

LASSEN NATIONAL FOREST

CUTOVER PLOT 9



1. Plat CO # 10, Lassen National Forest.
2. Date of Examination - July 30, August 1, 1934.
3. Location - S  $\frac{1}{2}$  section 13 T 30 N, R 8 E, M. D. M.
4. Land classification - U.S Government cutover - 320 acres.
5. Surrounded by similar cutover lands.
6. Altitude - 5800-5900 feet.
7. Timber type - Ponderosa Pine site 3.
8. Topography - Area level, no prominent topographic features.
9. Soil conditions - Volcanic soil of moderate depth and porosity.  
Rock outcrops present.
10. Brush cover - Manzanita, rabbit brush.
11. Precipitation - The nearest weather station is at Westwood which has a mean precipitation of 21.21 inches. It is probable slightly less rainfall occurs in this area.
12. Logged by Lassen Lumber and Box - 1924-1927.
13. Method of logging - Horses and caterpillars with slip tongue wheels.
14. Marking practice - Group selection, 1919.
15. Brush disposal - Slash, limbs excluded, piled and burned.
16. Gross timber estimates.

Original (Forest service cruise of 3/31/13/)

Tree species	320 acres	Per acre	% total
Ponderosa pine	4,617 M.B.M.	14,428 b.m.	82.3
White fir	995	3,109	17.7
Totals	5,612 M.B.M.	17,537 b.m.	

Cut - 14,500 per acre.

Left - 6,180 per acre.

Forest Service cutover cruise. Mallison and Edmonds, 1929.

Tree species	1,830,300 b.m.	5,720 b.m.	99.1
White fir	15,900	50	0.9
Totals	1,846,200 b.m.	5,770 b.m.	100.0

17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	320 acres	per acre	% Total	Ave. Vol.
					Volume per tree.
Ponderosa pine	2100	1,334,340 b.m.	4,326 b.m.	68.1	659
Jeffrey pine	936	588,420	1,830	28.9	629
Lodgepole pine	10	400	1	T	40
White fir	350	60,600	189	3.0	173
Totals	3396	2,033,760 b.m.	6,355 b.m.	100.0	

18. Losses in pine reserve.

Per Acre.

Ponderosa pine.

Stand at beginning of 1932.	6.56 trees	4326 b.m.
1932-1933 losses	0.3 trees	16.66 b.m.
Loss per year	0.1 trees	8.33 b.m.
% stand lost per year	0.15 % (trees)	0.19 % (b.m.)
Increment per year	43.91 b.m.	1.01 % of stand.
Net gain per year	35.58 b.m.	0.892 % of stand.

Jeffrey pine.	Per Acre	
Stand at beginning of 1932	2.93 trees	1.839 b.m.
1932-1933 losses	0.013 trees	9.06 b.m.
Loss per year	0.006 trees	4.53 b.m.
% loss stand per year	1.20 % (trees)	0.24 % (b.m.)
Increment per year	63.72 b.m.	3.46 % of stand.
Net gain per year	59.19 b.m.	3.22 % of stand.

19. Composition of infestation.

Insect species	% of total infested volume.
Ponderosa pine.	
<u>D. brevicomis</u> -----	79.4
<u>D. monticolae</u> -----	0.9
<u>Melanophila species</u> -----	19.7
Jeffrey pine.	
<u>D. jeffreyi</u> -----	28.3
<u>Melanophila species</u> -----	71.1

20. Tree selection (Dunning's)

Class	Total trees	Total infested trees	% infested per year	Relation to average loss.				
P.P.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
1	310	120	0	0	0	0	-	-
2	631	291	1	0	0.07	0.07	-	-
3	324	104	3	3	0.46	1.44	+	+
4	591	330	1	0	0.08	0.08	-	-
5	131	40	1	0	0.38	0	+	-
6	11	11	1	1	4.54	4.54	+	+
7	102	40	2	0	0.98	0	+	-

2. Diameter selection.

D.B.H.	Total trees	Total infested trees	% infested per year	Relation to average loss.				
P.P.	J.P.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.	
12	272	120	2	0	0.36	0	+	-
14	172	10	2	0	0.58	0	+	-
16	180	21	0	0	0	0	-	-
18	201	141	1	1	0.24	0.35	+	+
20	130	30	0	0	0	0	-	-
22	240	80	0	0	0	0	-	-
24	80	61	0	1	0	0.81	+	+
26	61	40	0	0	0	0	-	-
28	101	40	1	0	0.49	0	+	-
30	120	72	0	1	0	0.69	-	+
32	161	101	1	1	0.31	0.49	+	+
34	182	90	2	0	0.54	0	+	-
36	100	50	0	0	0	0	-	-
38	30	30	0	0	0	0	-	-
40	30	0	0	0	0	0	-	-
42	10	0	0	0	0	0	-	-
44	0	0	0	0	0	0	-	-
46	0	0	0	0	0	0	-	-
48	0	0	0	0	0	0	-	-
50	10	0	0	0	0	0	-	-

22. Growth trends - See figure 7

23. Pole stands and losses (% estimate - 10% green cruise - 100% insect losses)

D.B.H.	Tree species	Infested 1932-1933	% Infested per year	Rel. to ave. loss.
	Ponderosa			
	Pine			
4	1020	80		
6	1550	150		
8	1410	50		
10	450	90		
	Total 3430	370		
	Jeffrey			
	Pine			

White

Fir

800 No insect losses  
1150 found.

390

270

2610

24. Composition of infestation in poles.

No insect caused losses found.

25. Reproduction conditions.

Based on 32 - 1/10 acre plots of 1% cruise of total area.

Tree species	0-6"	6"-3.5"	Total	Over 3.5"
Ponderosa pine	9.78 %	1.41 %	11.9 %	
Jeffrey pine	1.25 %	0.44 %	1.69 %	
White fir	1.97 %	1.50 %	3.47 %	
Totals	13.00 %	3.35 %	16.35 %	6.38 %

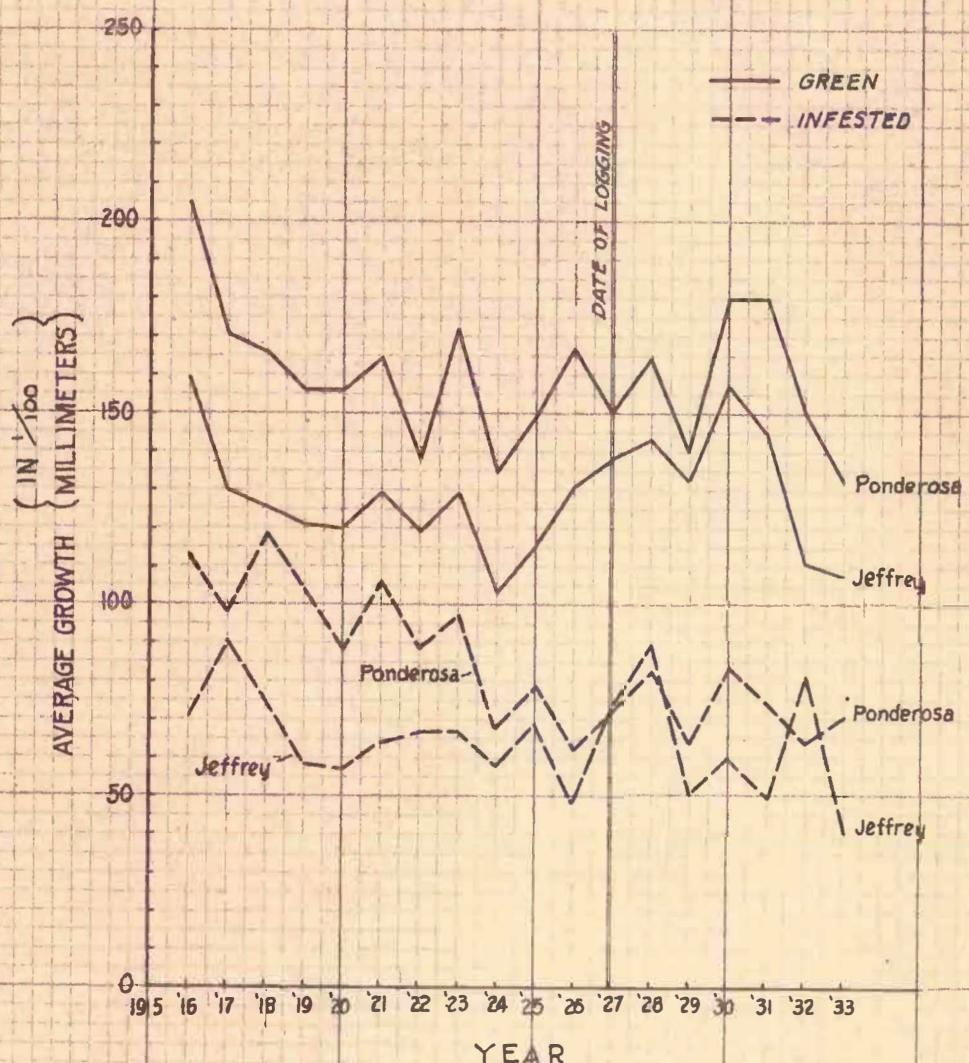
26. Infestation conditions in reproduction.

Evidence of feeding by sawflies (*Neodiprion* Sp.?) on Ponderosa pine was found. Apparently feeding was of a scattered nature and infestations were localized. Some injury by a lepidopterous terminal miner on the larger Jeffrey and yellow pine was found. However, infestation, under the crowns of the trees was not as heavily as in the open reproduction to the south in which great activity was observed.

## GROWTH OF GREEN AND INFESTED PONDEROSA AND JEFFREY PINE

LASSEN NATIONAL FOREST

CUTOVER PLOT 10



1. CO # 11, Stanislaus National Forest.
2. Date of Examination - June 18-19, 1934.
3. Location - In secs. 30-31, T. 4 N, R 18 E, M.D.M.
4. Land Classification - U.S. Government cutover - 160 acres.
5. Surroundings - Similarly cutover lands.
6. Altitude - 5,800 feet.
7. Timber type - Sugar pine, Ponderosa pine site 2.
8. Topography - Generally southeastern aspect except southeastern quarter of plot which has a northwestern aspect North Fork of Tuolumne River runs through the southeastern quarter of the plot. Northwestern three quarters of the plot has a steep slope that is made up of abrupt pitches and narrow fairly level benches.
9. Soil conditions - Soil granitic in origin and of medium to fairly great depth. Rather firm in structure.
10. Brush cover - Whitethorn, Ceanothus intergerrimus and manzanita.
11. Precipitation - No pertinent weather records. California Forest of Range Experiment Station Plot in this vicinity is considered to have normal precipitation of 42 inches per year although deficiencies have occurred during the past twenty years.
12. Logged by Pickering Lumber Co on 1928.
13. Method of logging - Donkey.
14. Marking practice - Danning Selection System.
15. Brush disposal - Piled and burned.
16. Gross timber estimates.

Original	160 acres	Per acre.
Ponderosa pine	355,000 b.m.	2,219 b.m.
Sugar pine	1, 076,000 b.m.	6,725 b.m.

Cut - Date not available

Left

Ponderosa pine	291,000 b.m.	1,819 b.m.
Sugar pine	396,000 b.m.	2,475 b.m.

17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	Vol. 160 A.	Vol. per A.	% Total	Ave. volume tree w
Ponderosa pine	1213	1,085,360 b.m.	6,787 b.m.	43.8	895
Sugar pine	890	800,320	5,002	32.3	976
White fir	1320	550,040	3438	22.1	417
Incense cedar	290	44,400	278	1.8	153
Totals	3643	2,480,620 b.m.	15,505 b.m.	100.0	

Losses in pine reserve.

Ponderosa pine	Per Acre.	
Stand at beginning of 1932	7.6 trees	6,787 b.m.
No insect losses (3-1934 trees having a total volume of 960 b.m. found at time of cruise.)		
Increment per year	113 b.m.	1.66 % of sta
Sugar pine		
Stand at beginning of 1932	541 trees	5,002 b.m.
No insect losses		
Increment per year	147 b.m.	2.93 % of sta

19. Composition of infestation.

No insect losses.

20. Tree selection (Dunning's)

No insect losses. Distribution of tree classes is as follows.

Class	Ponderosa		Sugar	
	Pine	Pine	Pine	Pine
1	71		30	
2	512		380	
3	40		40	
4	480		360	
5	50		0	
6	60		20	
7	0		0	

21. Diameter selection.

No insect losses. Distribution of diameter classes as follows.

D.B.H.	Ponderosa		Sugar	
	Pine	Pine	Pine	Pine
12	140		90	
14	120		130	
16	90		100	
18	122		30	
20	100		60	
22	71		50	
24	70		30	
26	90		20	
28	50		60	
30	70		20	
32	100		30	
34	50		40	
36	70		30	
38	20		40	
40	20		20	
42	10		10	
44	20		10	
46	10		10	
48	10		20	
50	0		10	
52	0		10	

22. Growth trends in reserve.

See figure #

23. Pole stands and losses in poles.

D.B.H.	White		Incense		Sugar		Ponderosa	Losses in ponderosa pine	Relation to
	fir	cedar	pine	pine	pine	pine			
4							5	32-33 1 % lost	
4	1600	350		110	980		20	1.32	+
6	1020	380		150	800		10	0.68	-
8	750	500		110	550		10	0.90	-
10	620	60		100	440		10	1.15	+
Totals	3990	1010		470	2770		50	0.90	

24. Composition of infestation in pole stands.

No information given on species infesting ponderosa pine poles. No poles of other species infested.

25. Reproduction conditions.

Standard method of reproduction cruising was not followed on this plot. It was noted little reproduction was present.

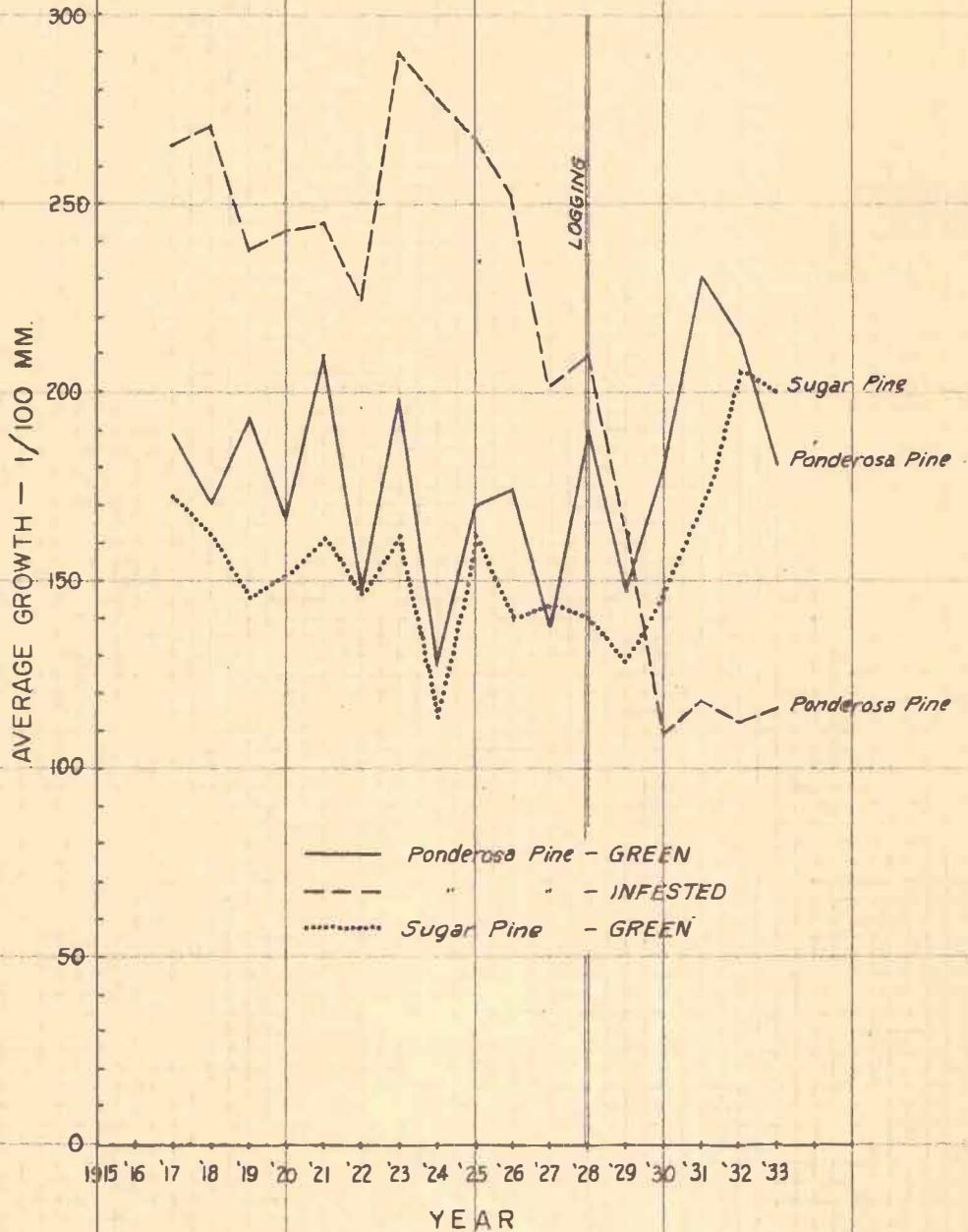
26. Infestation conditions in reproduction.

Although tip moth infestation (Rhyacionia pasadenana) was noted in pine reproduction on an area immediately to the south of the plot it was noted that no infestation occurred on the plot.

GROWTH OF GREEN AND INFESTED  
PONDEROSA AND SUGAR PINE

STANISLAUS NATIONAL FOREST

CUTOVER PLOT II



1. Plot CO # 12, Stanislaus National Forest.
2. Date of Examination - June 17-21, 1934.
3. Location - NE  $\frac{1}{4}$  and E  $\frac{1}{4}$  NW  $\frac{1}{4}$  Sec. 28, T, 4 N, R 18 E, M.D.M.
4. Land classification - U.S. Government cutover - 240 acres.
5. Surroundings - Similarly cutover lands on east and north. Uncut timber on south and west.
6. Altitude - 6,200 feet.
7. Timber type - Sugar pine- Ponderosa pine, site 2.
8. Topography - Medium slope having northern aspect. No marked topographic features.
9. Soil conditions - Granitic in origin, of medium depth, fairly porous and somewhat gravelly and satisfactory for tree growth. Well drained except for one small bog.
10. Brush cover - Gooseberry, whitethorn, Ceanothus integerrimus, bear-clover and manzanita.
11. Precipitation - As for nearby plots, the precipitation is probably near 42 inches per year. Deficiencies have probably occurred during the past 20 years.
12. Logged by Pickering Lumber Company - 1929-1930.
13. Method of logging - Caterpillars.
14. Marking practice - Heavy cutting of mature and overmature trees cutting Dunning's classes from 3 to 7 inclusive. Special marking on G.F.E.S. MC plots by Evans, Woodbury, Hall, Dunning and Pickering cruised. Outside plots marked by Parsons.
15. Slash disposal - Brush and small limbs up to 4" diameter piled and burned after fires rains. Large limbs and tops scattered.
16. Gross timber estimates.

Original (O.M. Evans, 1926)

	NE $\frac{1}{4}$ Sec. 28 alone.
Ponderosa pine	2,188 M.B.M.
Sugar pine	2,778
White fir	1,862
Incense cedar	599
Totals	7,427 M.B.M.

17. Cut - no data.

Left - no data.

17. Cutover cruise (10 % Estimate)

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	240 Acres	Volume	% of total	Average tree vol.
			per. acre	Volume	
Sugar pine	1160	784,410 b.m.	3,268 b.m.	28.6	676
Ponderosa pine	490	531,100	2,213	18.0	1084
White fir	3770	1,097,800	4,574	37.3	291
Incense cedar	1340	531,400	2,214	18.1	397
Totals	6760	2,944,710	12,269	100.0	

18. Losses in pine reserve.

Ponderosa pine	Per Acre.	
Stand at beginning of 1932 season.	2.0 trees	2,213 b.m.
No insect losses		
Increment per year	43.8 b.m.	1.97 % of stand
Sugar pine		
Stand at beginning of 1932 season	4.8 trees	3,268 b.m.
1932-1933 losses	.046 trees	19.3 b.m.
Loss per year	.023 trees	9.6 b.m.
% of stand lost per year	0.47 % (trees)	0.29 % (b.m.)
Increment per year	71.5 b.m.	3.18 % of stan
Net gain per year	61.9 b.m.	1.89 % of stan

7 trees containing 13,730 b.m. had been killed by 1934 breeds by the time the cruise was made. This is a considerable increase over losses of the two years preceding the 1934.

19. Composition of infestation.

Insect species % total infested volume.

Ponderosa pine

No insect losses

Sugar pine

D. monticolae 100.0 % (11 trees)

20. Tree class selection (Dunning's)

Class	Total trees	Total Infested trees	% Infested per year	Relation to average loss.
1	P.P.	S.P.P	P.P.P	S.P.
1	10	92	N	2
2	150	639	0	6
3	50	31		1
4	240	307	L	2
5	10	1	♦	0
6	20	60	S	0
7	10	10	S	0

21. Diameter selection.

D.B.H.	Total Trees	Total Infested Trees	% Infested per year	Relation to average loss.
	P.P.	S.P.	P.P.	S.P.
12	30	203	N	2
14	20	172	0	2
16	30	142		2
18	30	82	L	1
20	30	52	0	2
22	60	71	S	0
24	50	80	S	0
26	60	51	E	0
28	60	50	S	0
30	10	40		0
32	30	31		1
34	20	23		1
36	20	61		0
38	0	11		0
40	10	30		0
42	20	10		0
44	10	10		0
46	10	10		0
48	0	0		0
50	0	0		0
52	0	0		-
54	0	0		-
56	0	0		-
58	0	0	0	0.00
60	0	10	0	0.00

22. Growth trends - See figure #

### 23. Pole stands and losses in poles.

(% estimate - 10 % green cruise - 100 % infested poles.)

D.B.H. Tree Species Sugar Pine Only.

Oak	Incense Cedar	White Fir	Ponderosa Pine	Sugar Pine	Total Poles	Inf. per yr.	% Inv	Rel. ave. loss.
4	0	950	2070	60	421	1	0.11	-
6	10	1170	1970	140	484	4	0.41	-
8	30	620	1310	20	346	6	0.86	±
10	0	400	1310	40	353	3	0.42	-
<b>Totals</b>	<b>40</b>	<b>3140</b>	<b>6660</b>	<b>260</b>	<b>1804</b>	<b>14</b>	<b>0423</b>	

24. Composition of infestation in poles.

Although no information is given concerning the insect species infesting those poles cruised as insect losses the following notes give some information.

Several small patches of white fir and sugar pine on the plot had been recently killed by insects. These killings occur on ridges, spurs or points. Several fairly large groups of fir poles were infested by Scolytus ventralis and sugar pine by Ips confusus and D. monticola.

## 25. Reproduction conditions.

Based on 22 1/10 acre plots of 0.91 % of total area.

**Tree species**      0-6'      6'-3.5"      Total      Over 3.5"

Ponderosa pine 0.45 % 0.09 % 0.54 %

**Sugar pine** 2.14 0.09 2.23

White fin  9.55 1.50 11.05

Incense cedar 6.14 0.68 6.82

**Totals** 18.28 % .2.36 % 20.64 % 23.41 %

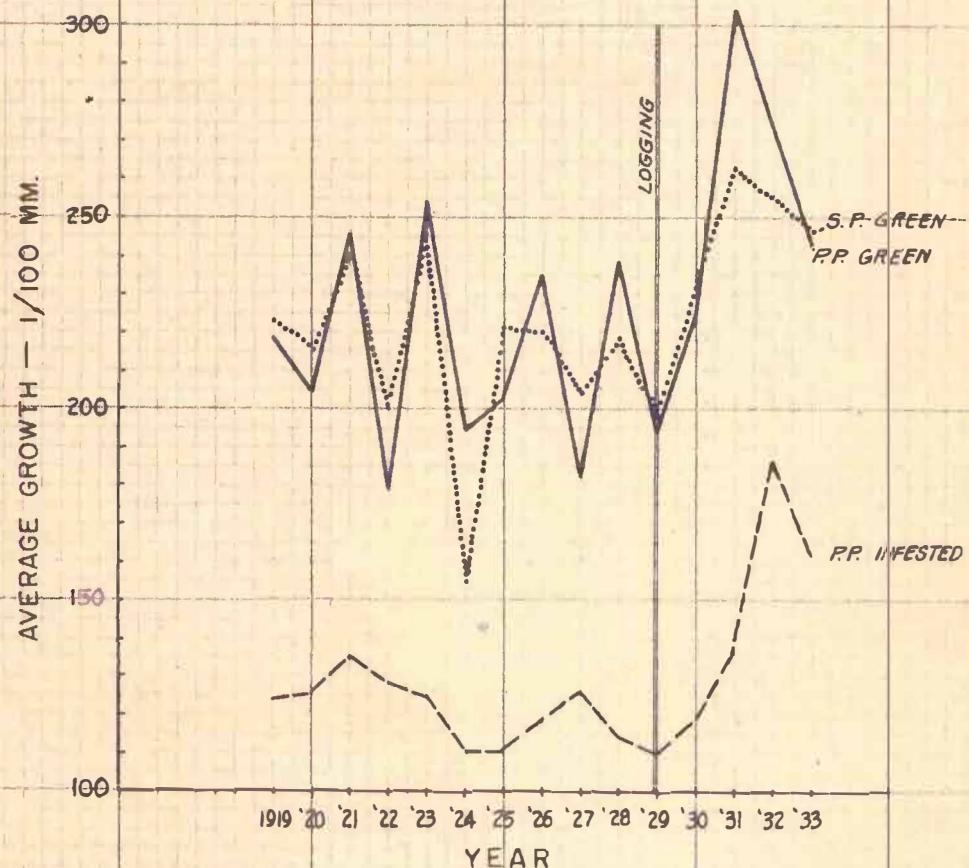
## 26. Infestation conditions in reproduction.

No quantitative data secured.

Small patches of infested sugar pine and white fir reproduction was found. The sugar pine was infested by Pissodes yosemite around the root collar and Cylindrocopturus longulus was reared in large numbers from the stems. White fir seedlings and reproduction was reported as infested by Scolytus praeceps.

## GROWTH OF GREEN AND INFESTED PONDEROSA AND SUGAR PINE

STANISLAUS NATIONAL FOREST      CUTOVER PLOT 12



1. CO # 15, - Stanislaus National Forest.
2. Date of Examination - July 10-11, 1934.
3. Location - S  $\frac{1}{2}$  SW  $\frac{1}{4}$  Sec. 27 and N  $\frac{1}{2}$  NW  $\frac{1}{4}$  Sec. 34, T 5 N, R 15 E, M.D.M.
4. Land classification- Privately owned cutover - 160 acres.
5. Timber of similar type surrounds the plot.
6. Altitude - 4500 feet.
7. Timber type - Ponderosa pine site 2.
8. Topography - Gently rolling type of country. Plot has southeast aspect.
9. Precipitation - West Point, which is some distance from the plot but in timber type that is comparable to that on the plot has a precipitation of over 30 inches per year. The 1933 record at that point was 34.26 inches. It is probable that the rainfall on the plot is somewhat heavier.
10. Brush cover - Manzanita, whitethorn, bear slover.
11. Soil conditions - Reddish clay-like soil of medium depth. Bakes hard during the summer season.
12. Logged by Manual Mill in 1904-1906.
13. Method of logging.- Horse and balls.
14. Marking practice - Very selective methods were used, most of the timber of smaller diameter being left. Clean cutting was practised on parts of the plot.
15. Brush disposal - Broadcast and burned.
16. Gross estimates - None.
17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Tree	160 Acres	Per Acre	% Total Vol.	Ave. tree	Volume.
Ponderosa pine	3333	1,409,640 b.m.	8,810 b.m.	84.7	423	
Sugar pine	92	42,710	267	2.6	464	
Incense cedar	580	210,700	1,317	12.7	563	
Oak	130					
<b>Totals</b>		<b>4,135 Trees</b>	<b>1,663,050 b.m.</b>	<b>10,394 b.m.</b>	<b>100.0</b>	

18. Losses in pine reserve.

	Per Acre.	
Ponderosa pine.		
Stand at beginning of 1932	20.83 trees	8,810 b.m.
1932-1933 losses	0.14 trees	87.5 b.m.
% loss per year	0.33 % (trees)	0.43 % (b.m.)
Loss per year	0.07 trees	43.7 b.m.
Increment per year	205.5 b.m.	2.33 % of stand.
Net gain per year	181.8 b.m.	1884 % of stand.
Sugar pine.		
Stand at beginning of 1932.	0.56 trees	267 b.m.
1932-1933 losses	0.01 trees	20.7 b.m.
Loss per year	0.005 trees	15.3 b.m.
% loss per year	0.89 % (trees)	5.73 % (b.m.)
Increment per year	Insufficient basis for estimates.	

19. Composition of infestation.

Insect species	% total infested volume.
Ponderosa pine	
<u>D. brevicornis</u>	100.0 %
Sugar pine	
<u>D. monticola</u>	83.5 % (1 tree)

Tree selection (Dunning's)

Class	Total no.	Trees	Total Infested trees	% Infested per yr.	Rel. to ave.		
	P.P.	S.P.	P.P.	S.P.	P.P.	S.P.	P.P.
1	1912	60	12	0	0.31	0	- S.P.
2	391	10	1	0	0.12	0	- not
3	536	1	6	1	0.55		+ enough
4	141	0	1	0	0.35		+ for
5	102	21	2	1	0.98		+ compar-
6	141	0	1	1	0.35		+ ison
7	110	0	0	0	0.00		- of

Sugar pine sample too small to give satisfactory basis for sample analysis. Distribution and losses as above.

21. Diameter selection.

D.B.H.	Total no.	Trees	Total Infested Trees	% Infested per Yr.	Rel. to Ave.
	P.P.	S.P.	P.P.	S.P.	A.P. P.P. Ave.
12.	965	30	5	0	0.26
14	554	10	4	0	0.36
16	364	0	4	0	0.54
18	180	0	0	0	0.00
20	340	20	0	0	0.00
22	122	0	2	0	0.81
24	220	10	0	0	0.00
26	70	0	0	0	0.00
28	122	11	2	1	0.81
30	190	0	0	0	0.00
32	104	10	4	0	0.92
34	21	0	1	0	2.38
36	30	0	0	0	0.00
38	20	0	0	0	0.00
40	30	0	1	0	1.61
42	0	0	0	0	
44	0	1	0	0	

22. Growth trends - See figure #

23. Pole stands and losses in poles.

D.B.H.	Tree Species				Ponderosa pine losses only.		
	Incense Cedar	White Fir	Sugar Pine	Ponderosa Pine	1932-33 losses	% inf.	Rel. to Per yr. ave.
4	490	20	20	1660	40	1.20	-
6	430	10	20	1580	20	0.63	-
8	400	0	20	1660	50	1.50	-
10	550	30	30	1770	100	2.82	+
Totals	1870	60	90	6670	210	1.37	

24. Composition of infestation in poles.

Ponderosa pine

Insect species % total infested poles.

D.brevicomis-----85.7%

Melanophilis-----14.3%

25. Reproduction conditions.

Based on 16. 1/10 acre plots of 1 % of total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	3.19	2.19	5.38	
Sugar pine	0.13	0.00	0.13	
Incense cedar	5.19	1.06	6.25	
White fir	0.06	0.00	0.06	
Oak	0.50	0.00	0.50	

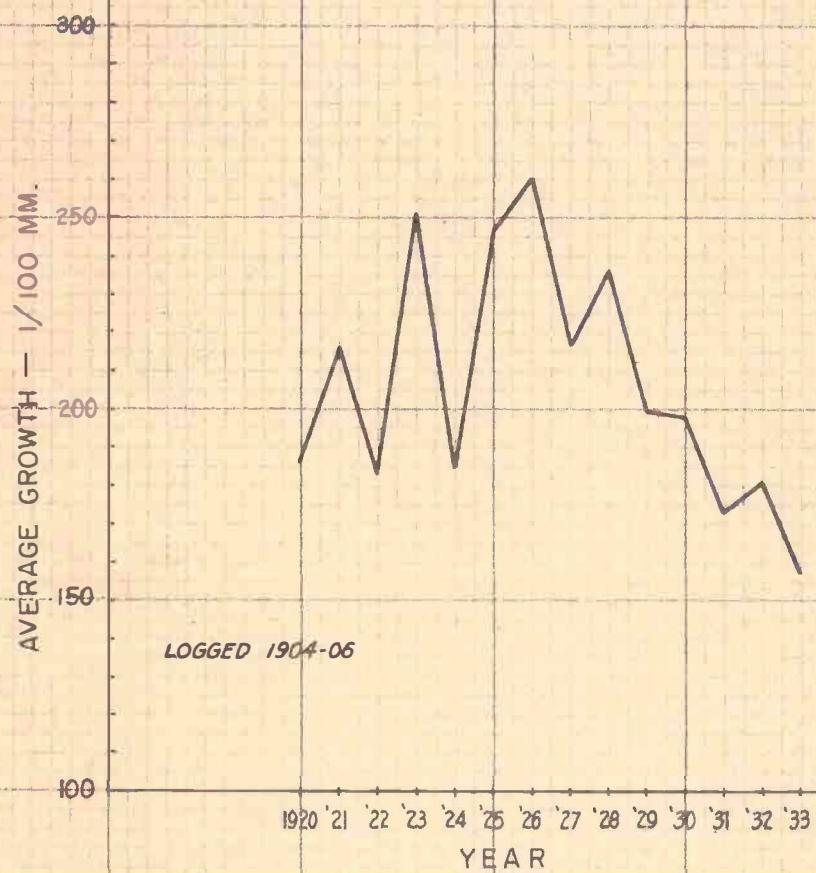
Tree selector

26. Infestation conditions in reproduction. A slight amount of flathead work in Ponderosa pine and Phloeosinus injury to incense cedar reproduction was found by the cruisers.

## GROWTH OF GREEN PONDEROSA PINE

STANISLAUS NATIONAL FOREST

CUTOVER PLOT 13



1. Plot CO # 14, Stanislaus National Forest.
2. Date of Examination - June 27-30, 1934.
3. Location - Parts of sections 17, 19 and 20, T 4 N, R 18 E, M.D.M.
4. Land classification - U.S Government cutover - 320 acres.
5. Surroundings - Similarly cutover land.
6. Altitude - 5,700 feet.
7. Timber type - Ponderosa pine type, site 2.
8. Topographgh - Medium to steep slopes haveng, in general, a southeastern aspect. The slope is cut by fairly deep water courses, many of them dry.
9. Soil conditions - Granitic in origin, of average depth and, in general, of a good type for tree growth. Rocky outcrops occur in some few portions of the area. Parts of the area that are covered with a heavy growth of bear clover have been scraped clean this season in an attempt to secure reproduction on such areas.
10. Brush cover - Witthorn, Ceanothus integerrimus, bear clover and manzanita.
11. Climate - A mean annual rainfall of 42 inches is considered to be about that falling on this area. There have been deficiencies for the past 20 years.
12. Logged by Pickering Lumber Company - 1927-1928.
13. Method of logging - Caterpillars and donkey.
14. Marking practice - Group selection. Classes 1,2 and 3 left.
15. Brush disposal - Slash piled and burned.
16. Gross estimates.

Original	6,080,000 b.m. (Everitt and Jones)
Cut	No data.
Left	About 6,000 b.m. per acre.

17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of the beginning of 1932 season.

Tree species	Total Trees	Volume, 320 acres	Volume % Total	Average per acre.	tree vol.
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Ponderosa pine	3242	1,694,760 b.m.	5,296	67.4	523
Sugar pine	668	380,010	1,188	15.1	569
White fir	780	357,500	1,117	14.2	481
Incense cedar	920	82,900	259	3.3	90
Oak	240	No volume			
Totals	5850	2,515,170	7,860		1,663

18. Insect losses in reserve.

Ponderosa pine	Per Acre.
Stand at beginning of 1932	10.1 trees 5,269 b.m.
1932-1933 insect losses	0.12 trees 54.2 b.m.
Loss per year	0.06 trees 27.1 b.m.
% of stand lost per year	0.59 % (trees) 0.51 % (b.m.)
Increment per year	69.1 b.m. 1.30 % of stand
Net gain per year	42.0 b.m. 0.80 % of stand

Sugar Pine	Per Acre.
Stand at beginning of 1932	2.1 trees 1188 b.m.
1932-1933 insect losses	0.025 trees 6.3 b.m.
Loss per year	0.13 trees 3.7 b.m.
% loss stand per year	0.61 % (trees) 0.31 % (b.m.)
Increment per year	30.3 b.m. 2.55 % of stand
Net gain per year	26.6 b.m. 2.24 % of stand

19. Composition of infestation.

Ponderosa Pine.

Insect Species.	% total infested volume.
D. brevicomis	72.2
<u>Melanophila species</u>	8.9
Ips confusus	7.3
Mixed infestation	11.6

Sugar Pine.

D. monticolae	100.0
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20. Tree selection (Dunning's)

Class	Total Trees		Trees Infested		% Infested per year		Relation to Average loss.		
	Total		P.P.	S.P.	P.P.	S.P.	P.P.	S.P.	P.P.
1	561	160	1	0	0.08	0.00	-	-	-
2	1141	186	20	6	0.87	1.01	+	+	
3	913	211	3	1	0.16	0.23	-	-	
4	299	40	8	0	1.33	0.00	+	-	
5	90	20	0	0	0.00	0.00	-	-	
6	75	31	4	1	2.66	1.61	+	+	
7	163	20	2	0	0.61	0.00	+	-	

21. Diameter selection.

D.B.H.	Total Trees		Trees Infested		% Infested per year		Relation to Average loss.		
	Total		P.P.	S.P.	P.P.	S.P.	P.P.	S.P.	P.P.
12	598	110	8	0	0.66	0.00	+	-	
14	477	144	7	4	0.73	1.38	+	+	
16	427	62	5	2	0.58	1.61	-	+	
18	274	31	4	1	0.72	1.61	+	+	
20	232	50	1	0	0.21	0.00	-	-	
22	172	50	2	0	0.58	0.00	-	-	
24	282	40	1	0	0.17	0.00	-	-	
26	83	10	3	0	1.80	0.00	+	-	
28	192	20	2	0	0.52	0.00	-	-	
30	171	20	1	0	0.29	0.00	-	-	
32	150	41	0	1	0.00	1.21	-	+	
34	82	70	2	0	1.21	0.00	+	-	
36	71	10	1	0	0.70	0.00	+	-	
38	20	0	0	0	0.00	-	-	-	
40	0	0	0	0	-	-	-	-	
42	19	0	0	0	0.00	-	-	-	
44	0	0	0	0	-	-	-	-	
46	0	10	0	0	-	0.00	-	-	
48	1	0	1	0	50.00	-	+	-	

22. Growth trends in reserves- See figure #

23. Pole stands and losses in poles.

(% estimate - 10 % green course - 100 % insect losses.)

D.B.H.	Tree Species	Total Infested		Rel.							
		Poles	per Year								
	Oak	White	Incense	Sugar	Ponderosa						
		Fir	Cedar	Pine	Pine	B.P.	P.P.	S.P.	P.P.	SP.P	P.P.
4	140	1030	760	232	2024	2	14	0.43	0.34	+	-
6	200	690	790	262	1621	3	21	0.38	0.64	-	+
8	140	440	520	241	1422	1	18	0.20	0.60	-	+
10	140	410	610	112	1140	2	20	0.89	0.89	+	+
Total	620	2570	2680	847	6263	7	73	0.41	0.58		

24. Composition of infestation in poles.

No quantitative information secured. Notes are made of Melanophila infestations in Ponderosa and Sugar pine poles, Phloeosinus in incense cedar and Scolytus in white fir. Losses in Incense cedar and White Fir were not cruised.

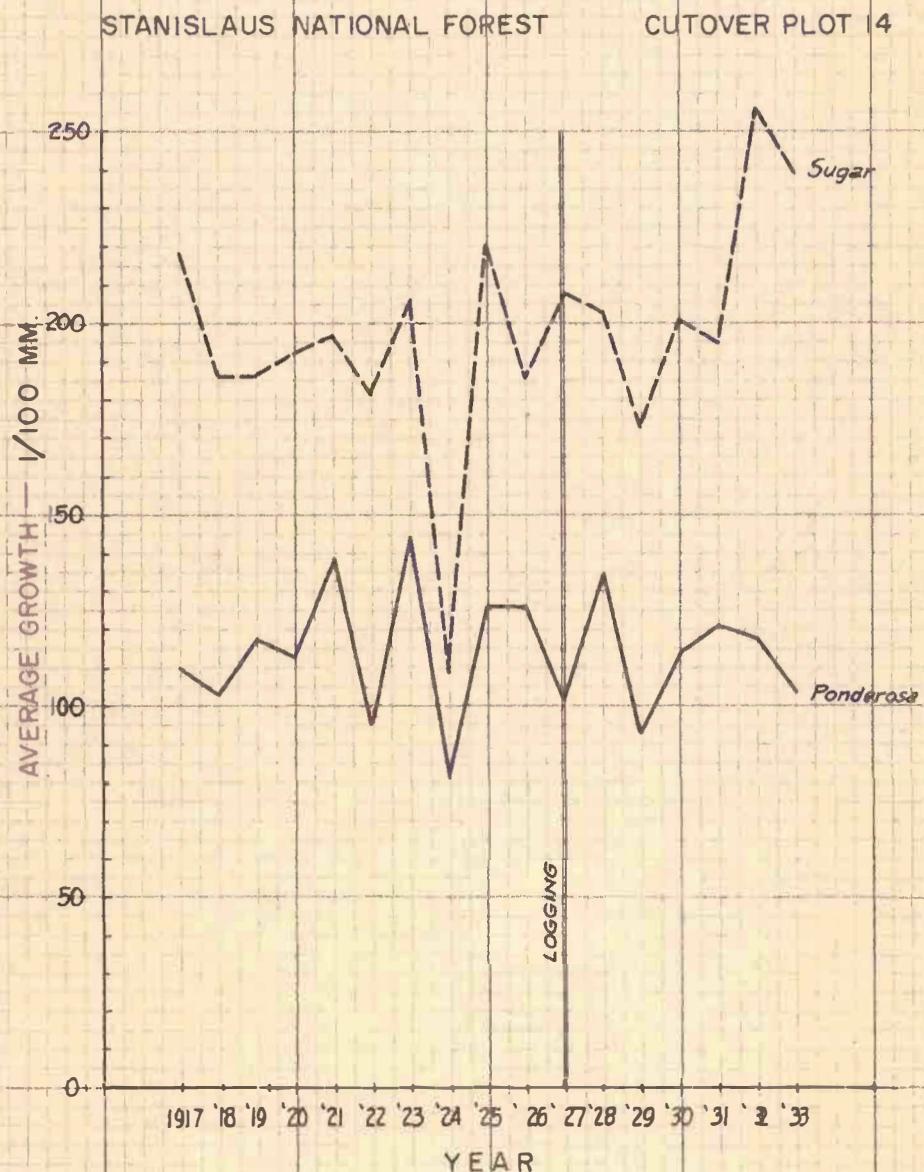
25. Reproduction conditions. Based on 32 1/10 acre plots or about 1 % of total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	1.44 %	0.69 %	2.13 %	
Sugar pine	0.91 %	0.09 %	1.00 %	
Incense cedar	3.69	0.25	3.94	
White fir	1.38	0.19	1.57	
Oak	0.34	0.06	0.40	
Total	7.76 %	1.28 %	9.04 %	17.73 %

26. Infestations in reproduction.

Notes on the plot state many young trees of a size included in reproduction are dead or dying. Melanophila are attacking ponderosa pine, Phloeosinus incense cedar and Scolytus ventralis the larger white fir.

## GROWTH OF GREEN SUGAR AND PONDEROSA PINE



1. CG 15, Stanislaus National Forest.
2. Date of examination - July 16-17, 1934.
3. Location NWNW, SWNW Sec. 14, NENE? SENE Sec. 15, T 1 S, R 19 E, M.D.M.
4. Land classification - U.S Government cutover - 150 acres.
5. Surroundings - Uncut and cutover stands of better type except to north.
6. Altitude - 4600 feet.
7. Timber type - Ponderosa pine, site 3.
8. Topography - Gentle to medium slope. Middle fork of Tuolumne River traversed plot as does the state highway from Carloinn to Mather.
9. Soil conditions - Granitic in origin and of shallow to medium depth. Soil loose and friable.
10. Brush cover - Bear clover, Ceanothus and Manzanita.
11. Precipitation - Mean annual precipitation at Lake Eleanor (4650 feet) is 38.43 inches. This is approximately the amount that falls on the plot.
12. Logged by California Peach Growers Association in 1920 to 24.
13. Method of logging - Donkey.
14. Marking practices - Region 5 standard selection after 1919.
15. Brush disposal - Piled, and partially burned. 50 % not burned.
16. Gross timber estimates - none available.
17. Cutover cruise - 10 % estimate.

Tree species	160 Acres	Per Acre	% Total Volume	Ave. Tree Vol.
	Trees	Volume B.M.		
Ponderosa pine	1037	397,520	2484 b.m.	383 b.m.
Sugar pine	260	223,300	1396	859
Incense cedar	620	84,800	530	137
White fir	200	89,300	558	446
Douglas fir	40	37,200	233	930
Oak	200			
Totals	2367	832,120	5201	

18. Losses in pine reserve.

	Ponderosa Pine	Per Acre.
Stand at beginning of 1932 season	6.5 trees	2484 b.m.
1932-1933 losses.	0.11 trees	116.8 b.m.
Loss per year	0.05 trees	58.4 b.m.
% of stand lost per year.	0.76 % (trees)	2.35 % (b.m.)
Increment per year.	45.2 b.m.	1.81 % of stand.
Net loss per year	13.2 b.m.	0.54 % of stand.

#### Sugar Pine

No insect losses in sugar pine. No basis for increment computations were secured.

19. Composition of infestation.

Insect species	% of total infested volume.
<u>D. brevicornis</u>	99.1
<u>Melanoplus</u> species	0.9

20. Tree selection. (% estimate - 10 % green trees, 100 % infested trees)

Class	Total	Total Infested	Infested	Relation to	
				Trees	Per Year
1	P.P. 673	S.P. 140	P.P. 7	S.P. 0	P.P. 0.54
2	53	10	3	0	2.83
3	74	40	4	0	2.70
4	23	30	3	0	6.52
5	20	20	0	0	0.00
6	70	0	0	0	0.00
7	60	20	0	0	0.00

## 21. Diameter selection.

D.B.H.	Total	Trees	Total Infested		% Infested Trees	Relation to per year.	average loss.
			P.P.	S.P.			
12	270	30	0	0	0.00	-	
14	212	50	2	0	0.47	-	
16	174	10	4	0	1.14	+	
18	140	20	0	0	0.00	-	
20	101	40	1	0	0.49	-	
22	10	10	0	0	0.00	-	
24	53	0	3	0	2.83	+	
26	43	20	3	0	5.48	+	
28	20	10	0	0	0.00	-	
30	70	0	0	0	0.00	-	
32	22	10	2	0	4.54	+	
34	20	10	0	0	0.00	-	
36	0	40	0	0	0.00	-	
38	0	0	0	0	0.00	-	
40	0	10	0	0	0.00	-	
42	1	0	1	0	50.00	+	
44	1	0	2	0	50.00	+	

22. Growth trends in reserve - see figure #

23. Pole stands and losses in poles

(% of estimate - 10 % in green poles. 10 % cruise of infested poles was made but was impossible to use because of exclusion of part of plot from final area due to uncut condition of stand.

D.B.H.	Ponderosa Pines	Sugar Pines	White Fir	Douglas Fir	Incense Cedar	Oak
4	1910	100	380	30	760	10
6	1510	110	450	30	610	30
8	1150	50	350	40	740	90
10	750	40	200	20	580	110
Totals	5320	300	1320	120	2890	240

24. Data on infestation in poles, due to lack of separation according to lines of cruise could not be used on the plot of reduced size on which this analysis is based.

25. Qualitative notes are as follows:

Small sugar pines (several) were found infested by Pissodes yosemite. Scattering of Incense cedar poles was found infested by secondary insects. Several groups of Incense cedar have died in last two years with no evidence of insect attack. Several groups had Phloeosinus attacks on boles.

Small area of PP poles killed by FH in 1932 found.

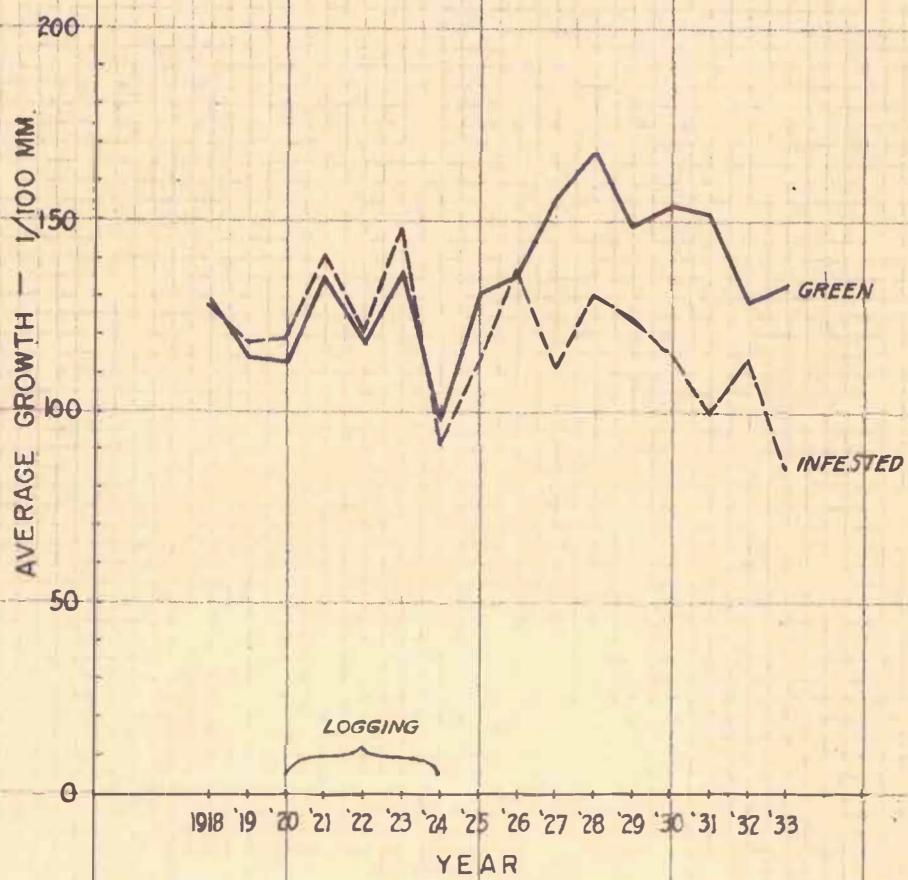
26. Reproduction conditions. Basis 16 1/10 acre plots or 1 % of total area.

Tree species	0-6"	6'-3.5"	Total	Over 3.5"
Ponderosa pine	5.25 %	3.12 %	8.37 %	
Sugar pine	1.25 %	0.18 %	1.43 %	
Incense cedar	6.25 %	1.06 %	7.31 %	
White fir	1.56 %	0.68 %	2.24 %	
Douglas fir	0.31 %	0.12 %	0.43 %	
Oak	0.18 %		0.18 %	
Totals	14.80 %	5.16 %	19.96 %	23.87 %

27. Infestation conditions in reproduction. No injury found beside some Pissodes in small sugar pine.

GROWTH OF GREEN AND INFESTED  
PONDEROSA PINE

STANISLAUS NATIONAL FOREST      CUTOVER PLOT 15



1. CO # 16 Stanislaus National Forest.
2. Date of examination - July 22-23, 1934.
3. Location NE  $\frac{1}{4}$  section 14, T. 2 S, R 19 E, M.D.M.
4. Land classification - Yosemite Lumber Company cutover - 160 acres.
5. Surrounded on north west and south by similar cutover land.
6. Altitude - 5900-6200 feet.
7. Timber type - Sugar pine, Fir.
8. Topography - A medium to abrupt slope having a southern aspect. Draining a permanent stream running north and south through the central portion. No pronounced topographic features.
9. Soil conditions - Granitic in origin and of medium depth and open texture. Fairly loose.
10. Brush cover - Whitethorn, Ceanothus, wild cherry and manzanita.
11. Precipitation - The nearest weather station, at Yosemite, has a mean precipitation of 32.97 inches per year. However, as it is at an elevation 2000 feet lower it is probably heavier precipitation occurs in the plot area.
12. Logged by Yosemite Lumber Company - 1924.
13. Method of logging - Donkey.
14. Marking practice - None, practically clean cut.
15. Slash disposal - None. Slash left broadcast.
16. Gross timber estimates - None secured.
17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	160 acres	Per Acre	% Total Vol.	Average Trees.	Vol.
--------------	-------	-----------	----------	--------------	----------------	------

Sugar pine	260	32,000 b.m.	200 b.m.	3.4	123
Ponderosa pine	60	11,300	71	1.2	188
White fir	660	792,800	4,955	83.7	1,201
Incense cedar	340	110,700	692	11.7	326
Totals	1320	946,800	5,918	100.0	

18. Losses in pine reserve.

No losses recorded. Core selection inadequate - no determinations of increment made.

Trees per acre - Sugar pine 1.63, Ponderosa pine 0.38.

19. Composition of infestation.

No infestation.

20. Tree selection.

No selection.

Distribution of tree classes as follows:

Class	Sugar pine	Ponderosa pine.
-------	------------	-----------------

1	220	20
2	0	0
3	0	0
4	0	0
5	0	0
6	40	20
7	0	20

Diameter selection

No selection.

Distribution as follows.

D.B.H.	Sugar pine	Ponderosa pine.
--------	------------	-----------------

12		
14	80	10
16	60	20
18	70	10
20	30	0
22	10	20
	10	0

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22. Growth trends.

See figure - basis probably not representative of cutover.

23. Pole stands and losses (10 % estimate green and insect losses.)

D.B.H.	Incense Cedar	White Fir	Ponderosa Pine	Sugar Pine
4	210	290	340	520
6	210	250	110	280
8	160	180	40	110
10	160	100	30	120
Totals	690	750	520	1030

24. Composition of infestation in poles.

No infestation in poles.

25. Reproduction conditions.

Based on 16 1/10 acre plots of 1 % of total area.

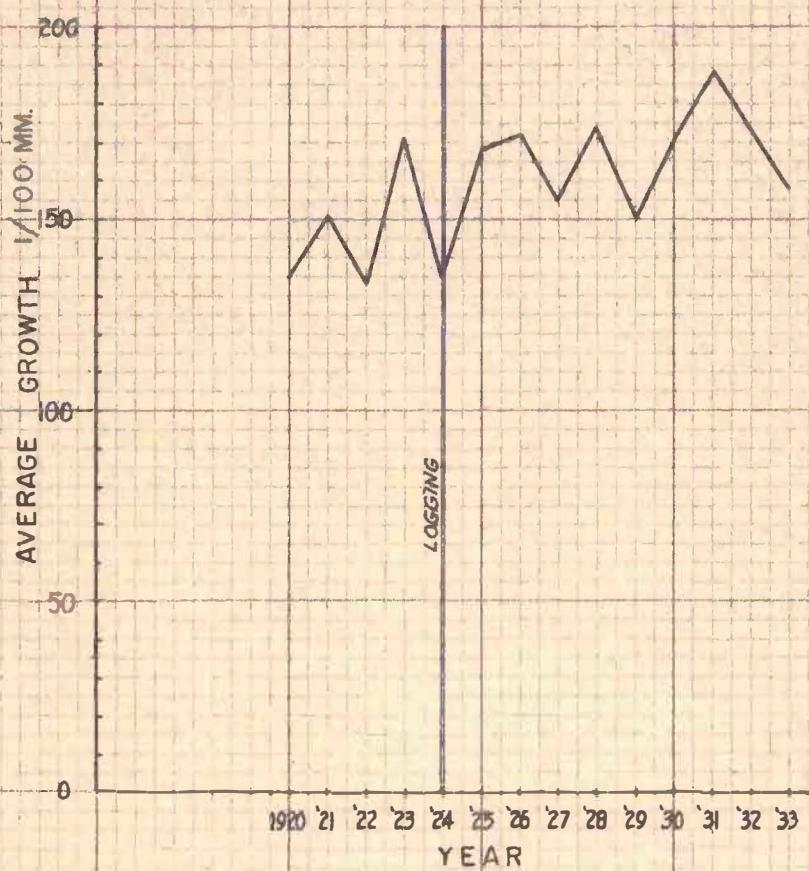
Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	1.38 %	0.56 %	1.94 %	
Sugar pine	7.63	2.38	10.01	
Incense cedar	1.06	0.31	1.37	
White fir	3.50	0.81	4.31	
Totals	13.57	4.06	17.63	

26. Infestation conditions in reproduction - No infestation reported.

## GROWTH OF GREEN SUGAR PINE

STANISLAUS NATIONAL FOREST

CUTOVER PLOT 16



1. CO # 17, Sierra National Forest.  
 2. Date of examination - July 27-28, 1934.  
 3. Location - NE  $\frac{1}{4}$  section 34. T. 4 S., R 20 E., M.B.M.  
 4. Land Classification - U.S. Government cutover - 160 acres.  
 5. Similar cutover surrounding.  
 6. Altitude - 6800 feet.  
 7. Timber type - Sugar Pine - Fir - Site 2.  
 8. Topography - Plot covers ridge top. Moderately rolling and sloping to the north east. Abrupt 100 deg. slope to southwest in southwest corner.  
 9. Soil conditions - Soil of granitic origin. Light, loose and of medium to shallow depth. Drainage good.  
 10. Brush cover - Gooseberry, whitehorn and manzanita.  
 11. Precipitation - The nearest record at Northfork, shows a mean annual precipitation of 32.5 inches. However, the plot lies 3800 feet higher in altitude. It is probable precipitation is much heavier on the area.  
 12. Logged by Madewa Sugar Pine Co., 1928.  
 13. Method of logging - Steam donkey with modified high lead.  
 14. Marking practice - Region 5, standard of 1919.  
 15. Brush disposal - Brush piled and burned (Forest Service Records) Brush not piled and burned on plot. (Field notes U.X.B.E.)  
 16. Gross timber estimates -  
 Original - 54,800 b.m. per acre.  
 Cut - 48,000 b.m. per acre.  
 Left - 6,800 b.m. per acre.  
 17. Cutover cruise.  
 Reconstructed from 1934 cruise for as of beginning of 1932 season.  

Tree species	Trees	160 Acres	Per Acre	% Total	Average tree Volume	Volume
Sugar Pine	1150	1,013,950 b.m.	6,337 b.m.	53.9	895	
Jeffrey Pine	20	17,800	111	0.9	223	
Ponderosa Pine	20	8,500	53	0.5	425	
White Fir	1690	799,900	4,999	42.5	473	
Incense Cedar	130	1, 41,200	258	2.2	317	
Totals	3050	1,881,330 b.m.	11,708 b.m.	100.0		

18. Losses in pine reserve.

	Per Acre.
Sugar pine.	
Stand at beginning of 1932	7.08 trees
1932-1933 losses	0.019 trees
Loss per year	0.010 trees
% loss per year	0.14 % (trees)
Increment per year	162.19 b.m.
Net gain per year	148.06 b.m.
	6,337 b.m.
	28.25 b.m.
	14.13 b.m.
	0.22 % (b.m.)
	265 % of stand.
	2.33% of stand.

19. Composition of infestation.  
 All infested trees were killed by D. monticola.

")

20. Tree selection.

Sugar Pine.

Class	Total Trees	Total Infested Trees	% Infested Per Year	Relation to Average Loss.
1	510	0	0	-
2	30	0	0	-
3	403	3	0.37	+
4	60	0	0	-
5	80	0	0	-
6	50	0	0	-
7	0			

21. Diameter selection

Sugar Pine.

D.B.H.	Total Trees	Total Infested Trees	% Infested Per Year	Relation to Average Loss.
12	90	0	0	-
14	110	0	0	-
16	60	0	0	-
18	60	0	0	-
20	150	0	0	-
22	20	0	0	-
24	100	0	0	-
26	71	1	0.40	+
28	71	1	0.40	+
30	130	0	0	-
32	70	0	0	-
34	111	1	0.45	-
36	50	0	0	-
38	20	0	0	-
40	20	0	0	-

22. Growth trends in reserve - See figure #

23. Pole stands and losses (Percent estimate - 10 % green - 10 % insect losses.)

D.B.H. Tree Species Sugar Pine only.

D.B.H.	Oak	Incense Cedar	White Fir	Ponderosa Pine	Jeffrey Pine	Sugar Pine	Infested 1932-33	% infes. per Yr. to	
								1932-33	per Yr. to
4	0	90	620	0	0	370	10	1.35	Ave.
6	10	50	620	0	0	270	30	5.55	+
8	40	20	510	10	10	300	40	10.00	+
10	30	20	500	10	0	200	30	7.50	+
<b>Total</b>	<b>80</b>	<b>180</b>	<b>2320</b>	<b>20</b>	<b>10</b>	<b>1040</b>	<b>110</b>	<b>5.28</b>	

24. Composition of infestation in poles.

All trees examined were killed by Melanophila species. Many poles and medium sized White Fir were killed during the past three years by Scolytus ventralis.

25. Reproduction conditions, Based on 16 1/10 acre plots or 1 % of total area.

Tree species	0-6"	6"-3.5"	Total	Over 3.5"
Sugar pine	1.93 %	1.60 %	3.53 %	
Jeffrey pine	0.13	0.00	0.13	
Ponderosa pine	0.47	0.27	0.74	
White fir	2.40	1.53	3.93	
<b>Totals</b>	<b>4.93 %</b>	<b>3.40 %</b>	<b>8.33 %</b>	<b>25.60 %</b>

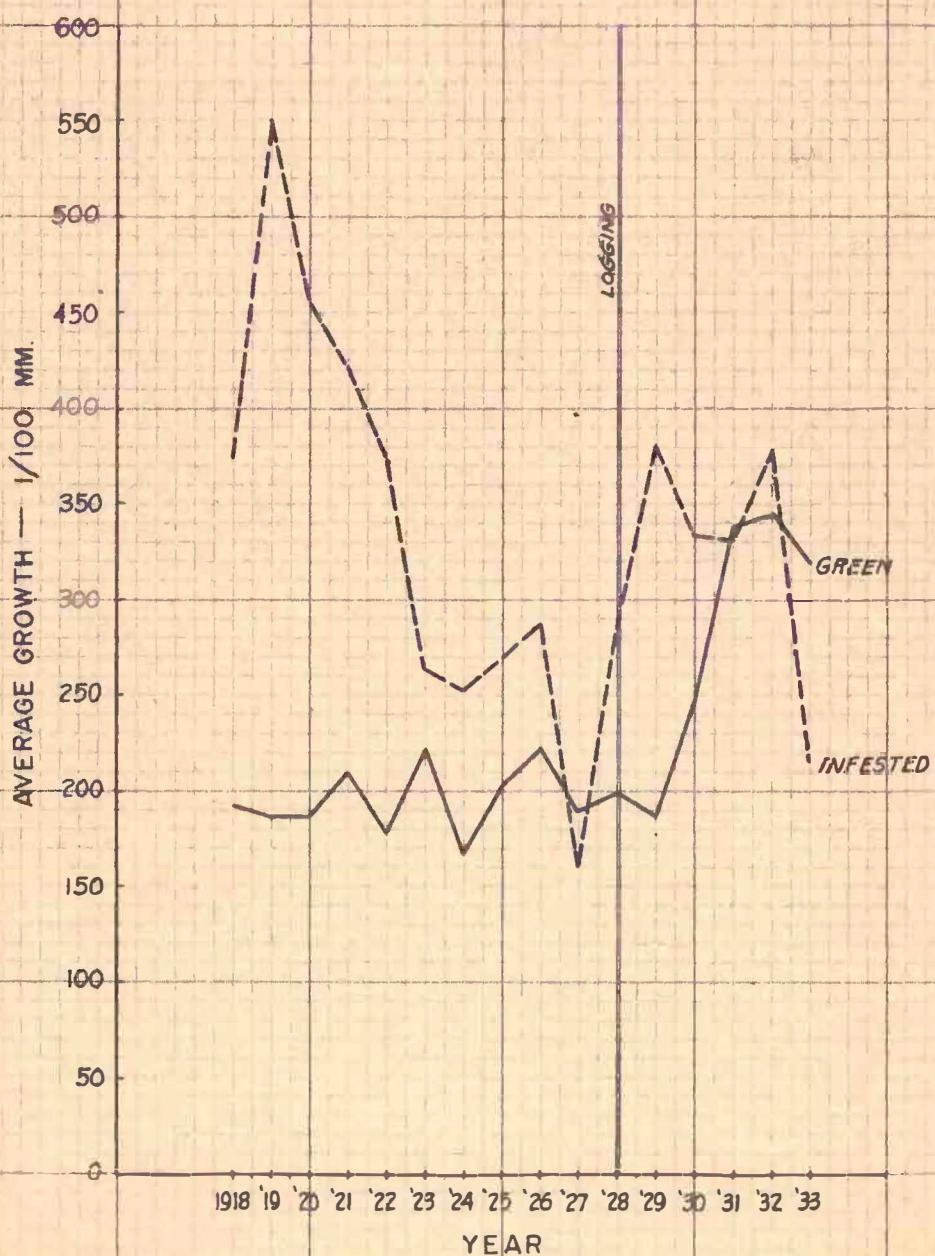
26. Infestation conditions in reproduction.

No information given in notes of field work.

## GROWTH OF GREEN AND INFESTED SUGAR PINE

SIERRA NATIONAL FOREST

CUTOVER PLOT 17



1. CO #18, Sierra National Forest.
2. Date of examination - July 30-31, 1934.
3. Location - Approximately SE  $\frac{1}{4}$  Sec. 21, T 5 S, R 20 E, M.D.M.
4. Land classification - Private ownership - 160 acres.
5. Condition of management - cutover land burned often of surrounding timber.
6. Altitude - 3200 feet.
7. Timber type - Ponderosa pine, site 4. Area has been almost clean cut and burned several times since cutting. The result is few large sized reserve trees and a fast growing stand of small bull pine. Fire has burned out southwest corner of the plot and completely denuded six acres.
8. Topographic characteristics - Gradual and even slope to the west. No outstanding topography. Several springs occur in the plot.
9. Soil conditions - Granitic in origin. Partly clay-like and of medium depth. Bakes hard during the summer season.
10. Brush cover - Mountain mahogany, manzanita, poison oak and buckthorn.
11. Precipitation - The mean precipitation of Mariposa, which is in the vicinity of 20 to 25 inches per year probably applies to this area.
12. Logged by private owner in 1907.
13. Method of logging - Bulls and trucks.
14. Marking practice - None, probably clean cut.
15. Brush disposal - None, probably left as cut from boles.
16. Gross estimates - None available.
17. Cutover cruise, 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932.

Tree species	No. Trees	Vol.	160 Acres	Vol. per Acre	% Total	Average tree Volume	Total Volume
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Ponderosa Pine	2031	287,820	b.m.	1,795	b.m.	96.1	141
Sugar Pine	10	300		2		0.1	30
Incense Cedar	160	11,300		71		3.8	71
Digger Pine	50						
Kalleg Oak	180						
Alder	560						
Totals	2,891	298,820	b.m.	1,868	b.m.	100.0	

18. Losses in reserve.

Ponderosa Pine	Per Acre.
Stand beginning of 1932 season	12,694 trees
	1,795 b.m.
1932-1933 losses	.006 trees
	7.56 b.m.
Loss per year	.003 trees
	3.78 b.m.
% loss per year	0.02 % (trees)
	0.21 % of stand.
Increment per year	90.88 b.m.
	5.06 % of stand.
Net gain per year	87.10 b.m.
	4.85 % of stand.

19. Composition of infestation.

The one large tree killed in the two years was infested by the western pine beetle.

## 20. Tree selection (Bunning's)

Class	Total No.	Total Infected	% Infested	Relation to Average Loss.
	Trees	Trees	Per Year	
1	1740	0	0	-
2	270	0	0	-
3	0			
4	0			
5	11	1	4.5%	+
6	10	0	0	-
7	0			

## 21. Diameter selection Ponderosa Pine.

B.B.H.	Total No.	Total Infected	% Infested	Relation to Average Loss.
	Trees	Trees	Per Year	
12	640	0	0	-
14	320	0	0	-
16	510	0	0	-
18	130	0	0	-
20	50	0	0	-
22	30	0	0	-
24	60	0	0	-
26	30	0	0	-
28	10	0	0	-
30	21	1	2.38	+
32	0			
34	0			
36	10	0	0	-

## 22. Growth trend in reserve.

See Figure #

## 23. Pole stands and losses., % Estimate (10 % green cruise - 10 % insect losses.)

B.B.H.	Tree Species					Ponderosa Pine Losses		
	Alder	Digger	Incense	Oak	Ponderosa	1938-39 % Infested	Relation to Average Loss.	
	Pine	Cedar	Pine	Pine	Losses	Per Yr.		
4	0	0	150	300	400	10	1.25	-
6	20	0	220	380	730	30	4.79	+
8	30	10	190	430	610	40	3.27	-
10	40	0	180	360	640	50	3.90	+
Totals	90	10	720	1480	2380	170	3.57	

## 24. Composition of infestation in poles.

No cruise data giving cause of death.

## 25. Reproduction conditions.

Based on 16 1.10 acre plots.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa Pine	0.07 %	0.14 %	0.21 %	
Digger Pine	0.00	0.14	0.14	
Incense Cedar	0.00	0.07	0.07	
Oak	0.47	0.07	0.54	
Totals	0.54 %	0.42 %	0.96 %	22.73

## 26. Infestation conditions in reproduction.

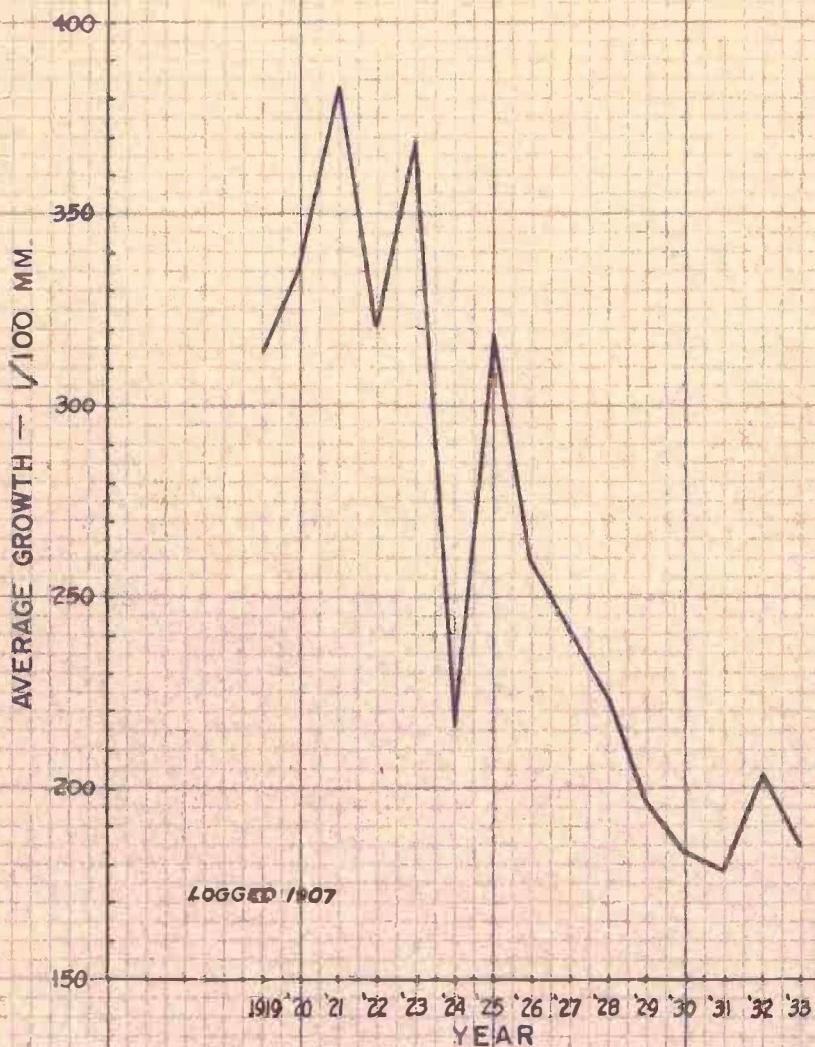
1. CO# 19, Sierra National Forest.
2. Date of examination-August 6-8, 1934.
3. Location - Parts of Sec. 2-3 T 7 S R 22 E.

Note - This plot has been removed from the series of cutover plots used in this study as it includes a considerable amount of virgin timber, the data on which it is impossible to remove from the records. The type, it represents, which is the upper pure Ponderosa Pine type, should have representation in the study. The exclusion of this plot is not to be desired but must be made as the results would not be typical of those on cutover lands.

## GROWTH OF GREEN PONDEROSA PINE

SIERRA NATIONAL FOREST

CUTOVER PLOT 18



1. CO # 20, Sierra National Forest.
2. Date of examination - August 9-10, 1934.
3. Location - NENE, NENE, NENW, SENW, SWNE, SENE Sec. 5, T 10 S, R 24 E. M.D.M.
4. Land classification - U.S. Government cutover - 240 acres.
5. Plot is included in larger and similar cutover area.
6. Altitude 3500 to 3900 feet.
7. Timber type - Ponderosa Pine type 4.
8. Topography - Moderate slope to west and north with drainage in general western portion of the plot.
9. Soil conditions - Granitic in origin, shallow and hard. Drainage good.
10. Brush cover - Mountain mahogany, manzanita, scrub oak and Ceanothus.
11. Climate - Auberry, at the 3000 foot altitude level has a mean annual precipitation of 22.29 inches. Rainfall on the plot should be, on the average, close to that figure.
12. Logged by Prescott Mill, 1922-1923.
13. Method of logging - Horses, steam donkey and motor trucks.
14. Marking practice - Selection system.
15. Slash disposal - Slash piled and burned.
16. Gross timber estimates.

Original 16,200 b.m. per acre.

Cut 14,400 b.m. per acre.

Left 1,800 b.m. per acre.

87.5 % of original stand was removed.

17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932 season.

Tree species	Trees	Vol. 240 Ac.	Vol. Per Ac.	% Tot. Vol.	Ave. Tree Volume.
Ponderosa Pine	1181	474,310 b.m.	1.976 b.m.	94.3	415 b.m.
Incense Cedar	130	28,800	120	5.7	222
Oak	620				
Digger Pine	90				
Totals	2121	502,110 b.m.	2096 b.m.	100.0	

18. Losses in pine reserve.

Ponderosa Pine	Per Acre.
Stand at beginning of 1932 season	4.92 trees
1932-1933 losses	0.16 trees
Loss per year	0.08 trees
% loss per year	1.62 % (trees)
Increment per year	39.63 b.m.
Net gain per year	5.90 b.m.

Incomplete 1934 losses amounted to 13 b.m. per acre.

19. Composition of infestation.

Ponderosa Pine	% total volume.
Insect species	% total volume.
<u>D. brevicornis</u> -----	76.9

Melanophila species—23.1

20. Tree selection (Dunning's)

Class	Total No.	Total Infested		% Infested	Relation to Average loss.
		Trees	Trees		
1	464	10		1.07	-
2	32	9		14.06	+
3	397	6		0.75	-
4	10	9		45.00	+
5	240	0		0.00	-
6	16	4		12.50	+
7	22	1	748	2.27	+

Basic data on tree selection is considered inaccurate.

21. Diameter selection.

D.B.H.	Total	Total Infested	% Infested	Relation to
	Trees	Trees	Per Year	Average Loss.
12.	202	2	0.49	-
14	156	3	0.96	-
16	229	6	1.31	-
18	96	5	2.60	+
20	96	5	260	+
22	55	4	3.63	+
24	70	7	5.00	+
26	72	2	1388	-
28	33	3	4.54	+
30	111	1	0.45	-
32	40	0	0000	-
34	21	1	2.38	+

22. Growth trends - See figure 4

23. Pole stands and losses (% estimate - 10 % green - 10 % insect loss)

D.B.H. Tree Species Ponderosa Pine Only.

D.B.H.	Oak	Incense Cedar	Digger Pine	Sugar Pine	Ponderosa Pine	32-33 % Loss	Relation to
						Losses Per yr.	Average Loss.
4	220	470	40	0	1660	10	0.30
6	180	390	80	10	1170	20	0.85
8	150	170	40	10	670	40	2.98
10	170	90	10	0	740	70	4.72
Totals	720	1120	170	20	4340	140	1.65

24. Composition of infestation in poles.

Ponderosa Pine only.

Insect species % total number infested poles.

D. brevicornis-----14.3

Melanophila species-----85.7

25. Reproduction conditions.

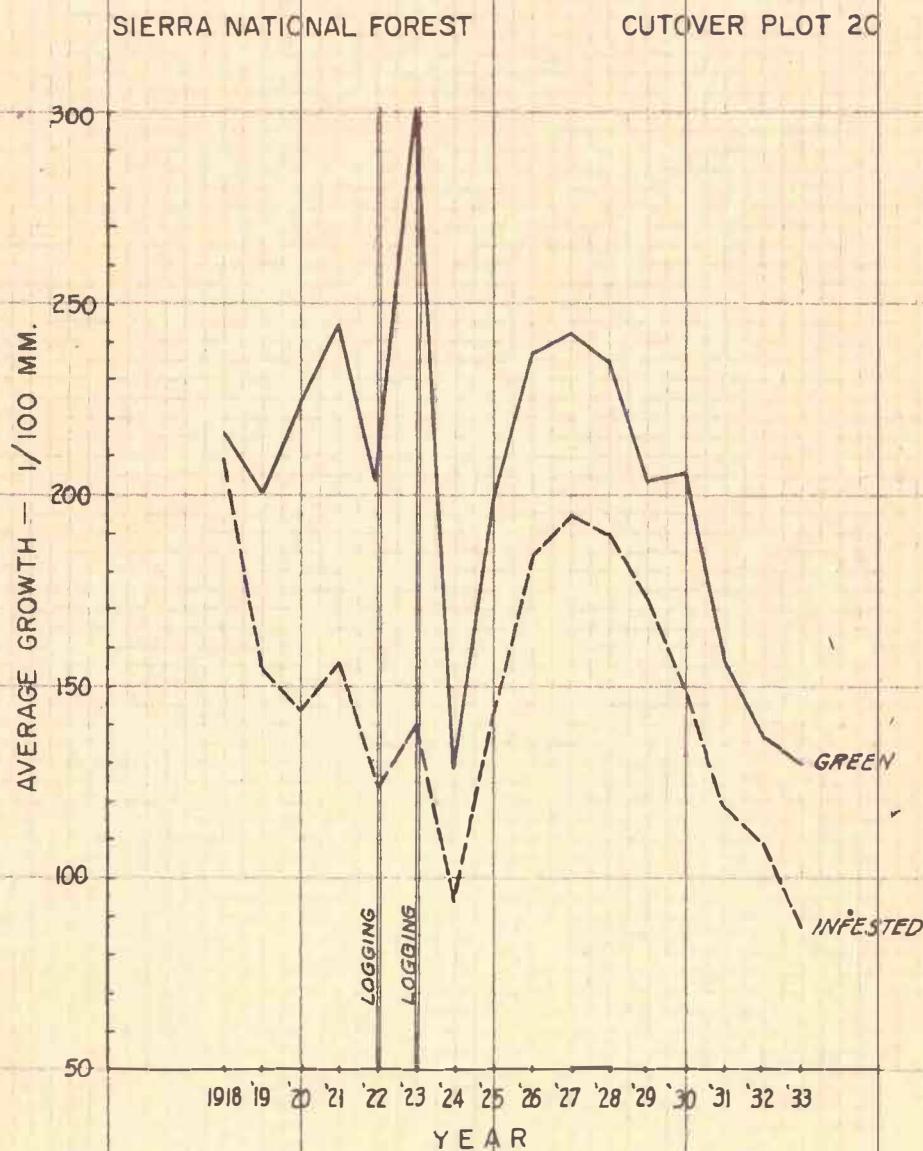
Based on 24 1/10 acre plots of 1 % of total areas.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa Pine	0.96 %	2.25 %	3.21 %	
Sugar Pine	0.04	0.04	0.04	
Digger Pine	0.00	0.04	0.04	
Incense Cedar	0.29	0.42	0.71	
Oak	0.13	0.00	0.13	
Totals	1.42 %	2.71 %	4.13 %	10.96 %

26. Infestation conditions in reproductions.

No insect depredations were reported as a result of the cruise. However, it has been observed that injury resulting from attack by a tip moth (Rhyacionia pasadenana) is fairly abundant on satisfactory host material in the area.

## GROWTH OF GREEN AND INFESTED PONDEROSA PINE



1. Plot CO # 21 - Sierra National Forest.
2. Date of examination - May 20, 1924 (Person), August 1-2, 1934.
3. Location - SE  $\frac{1}{4}$  Sec. 28, T 5 S, R 21 E, M.D.M.
4. Land classification - U.S. Government cutover - 160 acres.
5. Surroundings - Private lands.
6. Altitude - 5,000 to 5,500 feet.
7. Timber type - Sugar Pine, Ponderosa Pine - site 2.
8. Topography - Steep slopes having, in general, a southern aspect. A relatively deep canyon has been formed by Mienne Creek which traverses the plot from the Northwest corner to near the southeast corner.
9. Soil conditions - Soil granitic in origin, of medium depth except on ridges.
10. Brush cover - Whitethorn, manzanita, bear clover.
11. Precipitation - Northfork, having an annual mean precipitation of 32.5 inches per year is the closest and possibly the most pertinent weather record.
12. Logged by Madera Sugar Pine Company - 1905-1906.
13. Method of logging - Low speed ground lead donkey.
14. Marking practice - Selection system, 1905-1908.
15. Brush disposal - piled and burned.
16. Gross timber estimates.
 

Original stand--No estimate.

Cut-----Estimated at 12,400 b.m. per acre (Pines only?)

Left-----Estimated at 8,200 b.m. per acre (Pines only?)

17. Cutover cruise.

Person gave the following figures as of 1922. (Forest Service Cruise)

Tree species	160 Acres	Per Acre	% Total Stand.
Ponderosa Pine	434 M.B.M.	2,712 b.m.	17.48
Sugar Pine	875	5,469	35.24
White Fir	619	3,869	24.93
Inconsp Cedar	555	3,469	22.35
Totals	2,483 M.B.M.	15,519 b.m.	

Increment in both Ponderosa and Sugar Pine was calculated by Person, in 1924 as 1, 12 % of the stand. More recent figures have not been secured.

18. Losses in pine reserve.

Tree species	Ponderosa Pine.	Per acre.
Stand as of 1922		2,712 b.m.
1932-1933 insect losses		92.5 b.m.
Loss per year		46.2 b.m.
% of stand lost per year		1.70 % of stand.
Increment per year	30.4 b.m.	1.12 % of stand.
Net loss per year	15.8 b.m.	0.58 % of stand.
Sugar Pine		
Stand as of 1922		5,469 b.m.
1932-1933 insect losses		50.0 b.m.
Loss per year		25.0 b.m.
% of stand lost per year		0.46 % of stand.
Increment per year	61 b.m.	1.12 % of stand.
Net gain per year	36 b.m.	0.66 % of stand.

19. Composition of infestation., Ponderosa Pine.

Inset species	% of total volume infested.
<u>D. brevicomis</u>	99.5 %
<u>Melanophila species</u>	0.5
Sugar Pine	
<u>D. monticolae</u>	100.0 %

20. Tree selection - No data secured on green stand.

21. Diameter selection - No data secured on green stand.

22. Growth trends in reserve - See figure #

23. Pole stands and losses in poles - No data secured.

24. Composition of infestation in poles - No data secured.

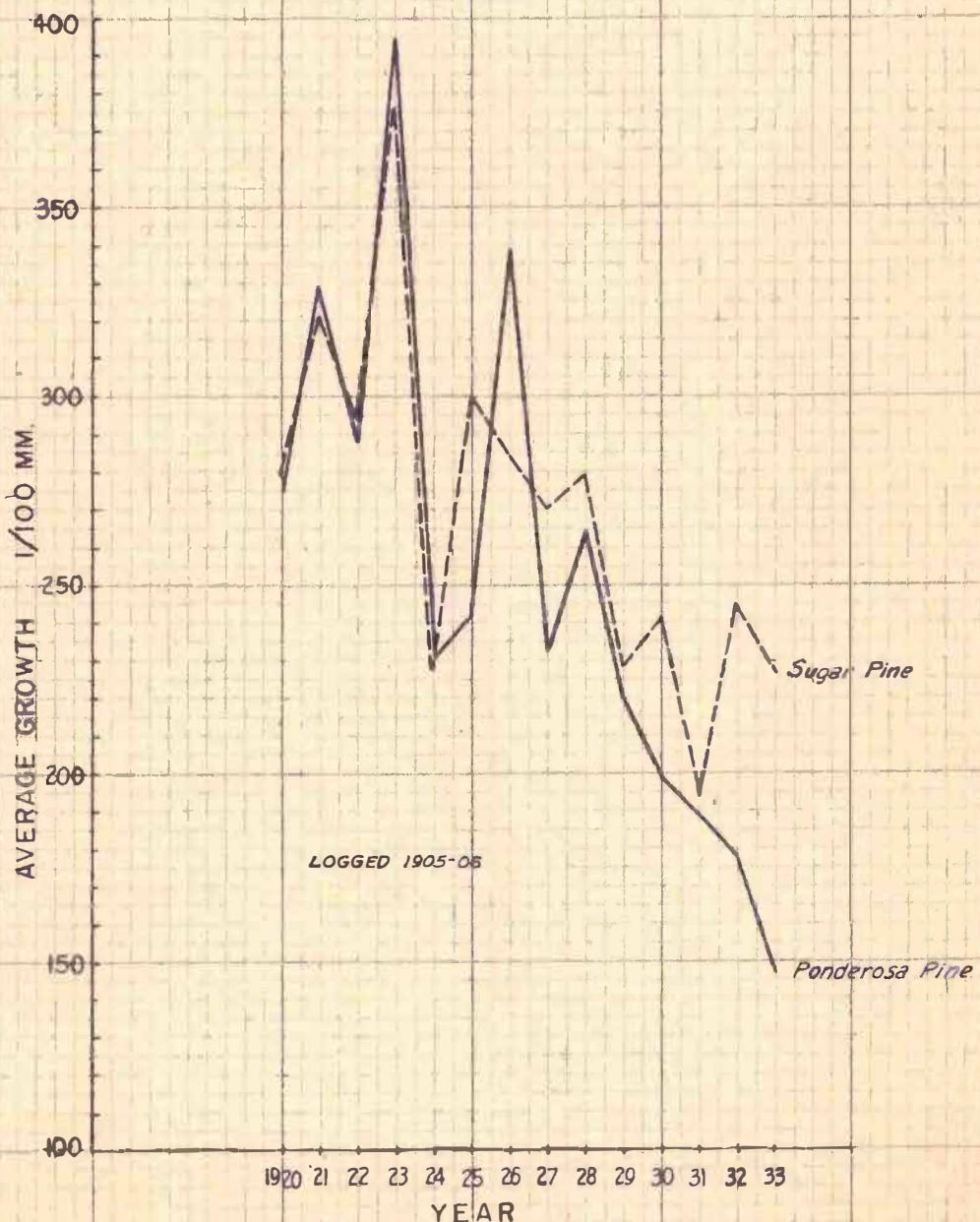
25. Reproduction conditions - No data secured.

26. Infestation condition in reproduction - No data secured.

GROWTH OF GREEN  
PONDEROSA AND SUGAR PINE

SIERRA NATIONAL FOREST

CUTOVER PLOT 21



1. Plot CO # 22, Sierra National Forest.
2. Date of examination - May 8, 1924 (Person) August 13-17, 1934.
3. Location - Section 16, T 9 S, R 25 E, M.D.M.
4. Land classification - U.S. Government cutever 640 acres All but 40 acres in the northwestern portion of the section, which is fir type, is cut. The 40 acres were excluded from consideration.
5. Surroundings - Uncut timber to the north which is definitely separated from the stand on the plot by a high ridge. More heavily cut private lands bound the plot on the east, south and west.
6. Altitude - 5,800 to 6,300 feet.
7. Timber type - Sugar Pine - Ponderosa Pine site 2.
8. Topography - Moderately sloping to roughly precipitous. North fork of Stevenson Creek traverses the southeast quarter of the section. Aspect southern.
9. Soil conditions - Soil of granitic origin, somewhat sandy. There has been a consideral amount of erosion at Stevenson Creek.
10. Brush cover - Heavy brush cover exists over most of the plot. The species concerned are whitethorn, manzanita and gooseberry.
11. Precipitation - The nearest weather station, at Big Creek, has a mean annual precipitation of 28.77 inches per year. It is believed this figure applies fairly closely to the plot.
12. Logged by Fresno Flume and Irrigation Company - 1907-1911.
13. Method of logging - Low speed ground lead steam donkey in chutes.
14. Marking practice - Selection system of 1905-1909. A very light cut made and heavy reserve left. Chiefly in order to protect the more valuable pine species.
15. Brush disposal - Piled and burned.
16. Gross timber estimates.

Original estimate - No estimate.  
 Cut - Approximately 17,800 b.m. per acre.  
 Left - (Cruise of 1919 - after Person.)  
 Ponderosa Pine 5,261 b.m. Per Acre.  
 Sagar Pine 6,494  
 White Fir 3,455  
 Incense Cedar 1,358  
 Total 16,566 b.m. Per Acre.

17. Cutover cruise - is given above. No cruise made by U.S.B.E. crew.  
18. Losses in pine reserve.

18. Losses in pine reserve.

**Tree Species** **Per Acre.**

## Ponderosa Pine.

Stand as of 1919 5,261 b.m.

1932-1933 losses 0.04 trees 110 b.m.

Loss not yet 0-08 trans 55 b.m.

1st stand lost non-wet 1.04 \$ 0

1000 g of stand. 0.22 g of stand.

increment per year (person) 35.000 0.75 % to stand. 0.75 % of stand.

Net loss per year 17.5M. 0.51 % of stand.

1934 losses in Ponderosa Pine, at time of cruise amounted to 10

trees and 24,620 b.m.

## Sugar Pine.

Stand as of 1919 0. 6,494 b.m.

1932-1933 losses 0.13 trees 483 b.m.

Loss per visit 0.02 trace 242 p.m.

1988 per year 6,637 trees 145,000 plant 3-22 % of stand.

or stand least per year 5.00 per stand. (Pecan) 12 b m 25.00 1.00 5 of stand.

Increment per year (Person) 89 5.M. 2-31-1957 p. 51 Stand.

Net loss per year 173 b.m. 8.65 % of stand.  
1934 loss in Sugar Pines, at time of cruise, amounted to 16 trees and 72,450 b.m.

19. Composition of infestation.

Insect species      % of total infested volume.

Ponderosa Pine.

D. brevicornis----- 87.8

Melanophila species----- 8.4

Mixed infestation----- 3.8

Sugar Pine

D. monticolus----- 97.0

Mixed infestation----- 3.0

20. Tree selection - no data secured on green trees.

21. Diameter selection - No data secured on green trees.

22. Growth trends in reserve - See figure #

23. Pole stands and losses - No data secured.

24. Composition fo infestation in poles - No data secured.

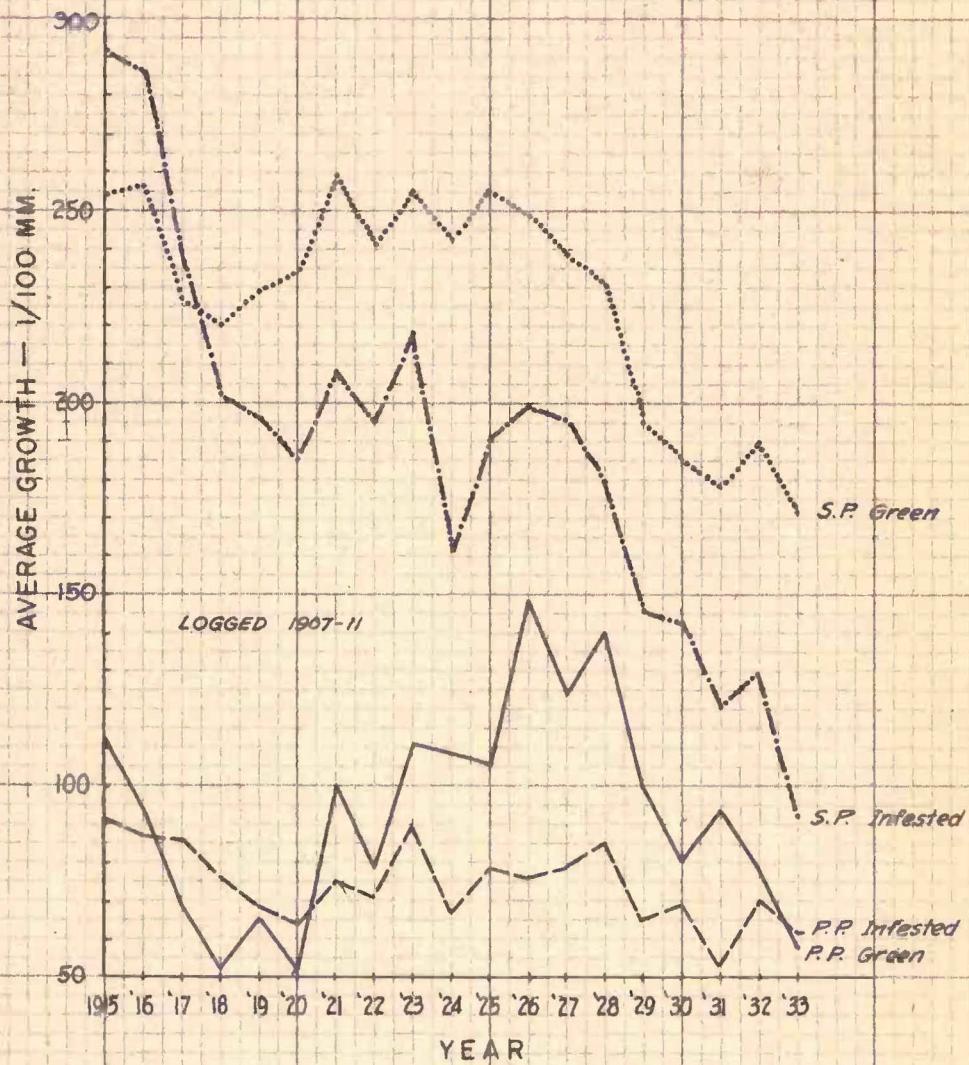
25. Reproduction conditions - No data secured.

26. Infestation in reproduction - No data secured.

## GROWTH OF GREEN AND INFESTED PONDEROSA AND SUGAR PINE

SIERRA NATIONAL FOREST

CUTOVER PLOT 22



1. CO # 23, Plumas National Forest.
2. Date of examination - August 15-17, 1934.
3. Location S  $\frac{1}{2}$  Sec. 26, T 25 N, R 13 E.
4. Land classification - U.S. Government cutover 320 acres.
5. Similarly cut timber is found on the north, west and south.  
The timber margin is at the east end of the plot.
6. Altitude - 6,000 to 6,400 feet.
7. Timber type - Ponderosa Pine - Jeffery Pine type, site 4.
8. Topography - Fairly rough country with numerous rocky outcrops and rims.
9. Soil conditions - Volcanic in origin, shallow, porous in structure for the most part although hard packed near sheep bedding grounds.
10. Brush cover - Chrysothamnus and Artemesia Spp.
11. Climate - There is no nearby weather station furnishing records applicable to the area in which the plot is situated. ~~This~~ The plot lies in the 10-20 inch rainfall belt but, from evidence on the plot it is apparent rainfall is somewhat less than on Plumas # 6.
12. Logged by Clover Valley Lumber Co., 1926-27.
13. Method of logging - Caterpillar skidding with big wheels.
14. Marking practice - Dunning system. Marked by D. A. Buchanan.
15. Slash disposal - Brush and limbs to 4" piled and burned.
16. Gross timber estimates.

Original	16,580 b.m. Per Acre	100.0 %
Cut	13,610 b.m. Per Acre	.82.2 %
Left	2,950 b.m. Per Acre	17.8 %

17. Cutover cruise - 10 % estimate.

(Reconstructed from 1934 cruise for as of beginning of 1932 season.)				
Tree species	Trees	320 Acres	Per Acre	% Total Volume
Ponderosa Pine	794	227,660 b.m.	711 b.m.	15.9
Jeffrey Pine	1896	617,220	1929	43.4
White Fir	820	368,900	1153	25.8
Incense Cedar	700	212,200	663	14.9
Juniper	320	No Vol.		
Totals	4530	1,425,980 b.m.	4456 b.m.	100.0

18. Losses in Pine reserve.

	Ponderosa Pine.	Per Acre.	
Stand at beginning of 1932	2.48 trees	711 b.m.	
1932-1933 Losses	0.07 trees	46.5 b.m.	
Loss per year	0.03 trees	23.2 b.m.	
% of stand lost per year	1.61% of trees	3.26 (b.m.)	
Increment per year	11.4. b.m.	1.61% of stand.	
Net loss per year	11.8 b.m.	1.65% of stand.	

	Jeffrey Pine.		
Stand at beginning of 1932	5.93 trees	1,929 b.m.	
1932-1933 losses	0.16 trees	73.5 b.m.	
Loss per year	0.08 trees	36.8 b.m.	
% of stand lost per year	1.34% (trees)	1.90% (b.m.)	
Increment per year	21.4% b.m.	1.11% of Stand.	
Net loss per year	14.6 b.m.	0.79% of stand	

19. Composition of infestation.

Insect species	% of Total infested volume.
Fonderosa Pine.	
<u>D. brevicornis</u>	40.7
<u>Melanophila species</u>	36.3
<u>D. monticolae</u>	6.1
<u>Ips oregoni</u>	0.3
Mixed infestation	16.6
Jeffrey Pine.	
<u>D. jeffreyi</u>	17.9
<u>Melanophila species</u>	73.1
Mixed infestation	9.0

20. Tree selection (Dunning's)

Class	Total no. Trees	Total Inf. Trees	% Infested	Pr Yr.	Rel. to ave. loss.	P.P. J. P.
Trees						
1	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
1	100	200	0	0	0.00	0.00
2	382	785	2	13	0.26	0.82
3	167	518	7	18	2.09	1.73
4	63	138	3	4	2.38	1.44
5	17	57	6	7	17.64	6.14
6	12	40	2	0	2.50	0.00
7	53	160	3	0	2.83	2.81
Diameter selection.						
D.B.H.	Total no. Trees	Total Inf. Trees	% Infested	Pr Yr.	Rel. to ave. loss.	P.P. J. P.
Trees						
12	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
13	262	410	2	0	0.38	0.00
14	82	176	2	5	1.21	1.21
15	101	247	1	5	0.49	1.02
16	91	199	1	9	0.54	2.26
20	32	209	2	7	4.54	1.67
22	50	151	0	1	0.00	0.38
24	53	96	3	5	2.83	2.60
26	23	88	3	8	6.52	4.54
28	44	163	4	3	4.54	0.92
30	22	62	1	1	2.27	0.80
32	20	54	0	4	0.00	3.70
34	1	22	1	2	50.00	4.54
36	10	0	0	0	0.00	-
38	11	1	1	1	4.54	50.00
40	1	20	1	0	50.00	0.00
42	1	10	1	1	50.00	0.00
44	0	10	0	0	0.00	-

22. Growth trends.

See figure#

23. Pole stands and losses in piles.

% estimate - 10% green cruise - 100% insect losses.

D.B.H.

	Juniper	Incense	White	Tree Species.	
				Cedar	Fir
4	190	500	1510	1105	1012
6	620	510	2670	1601	1540
8	190	210	1190	624	452
10	70	140	80	531	213
Totals	1070	1360	5450	3861	3218

1932-1933 losses % loss pr. Year Rel to average loss.

D.B.H.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
4	4	2	0.18	0.09	+	-
6	1	1	0.03	0.03	-	-
8	4	2	0.32	0.22	+	+
10	1	3	0.09	0.70	-	+
Totals	10	8	0.12	0.12		

24. Composition of infestation in poles.

Insect species % Total Infested Poles.

Ponderosa Pine.

<u>Melanophila</u> species	70%
<u>D. monticolae</u>	10
<u>Ips oregoni</u>	10
Mixed Infestation	10

Jeffrey Pine

<u>Melanophila</u> species	88.9 %
<u>Ips oregoni</u>	11.1

25. Reproduction conditions.

Based on 32 1.10 acre plots of 1% of total area.

Tree species	0-6'	6'-3.5"	Total	Over 3.5"
Ponderosa pine	1.91 %	1.81 %	3.72 %	
Jeffrey Pine	3.88	1.78	5.66	
Incense Cedar	1.50	0.75	2.25	
White Fir	2.34	2.09	4.43	
Juniper	0.13	0.13	0.26	
Totals	9.76	6.56	16.32	6.35

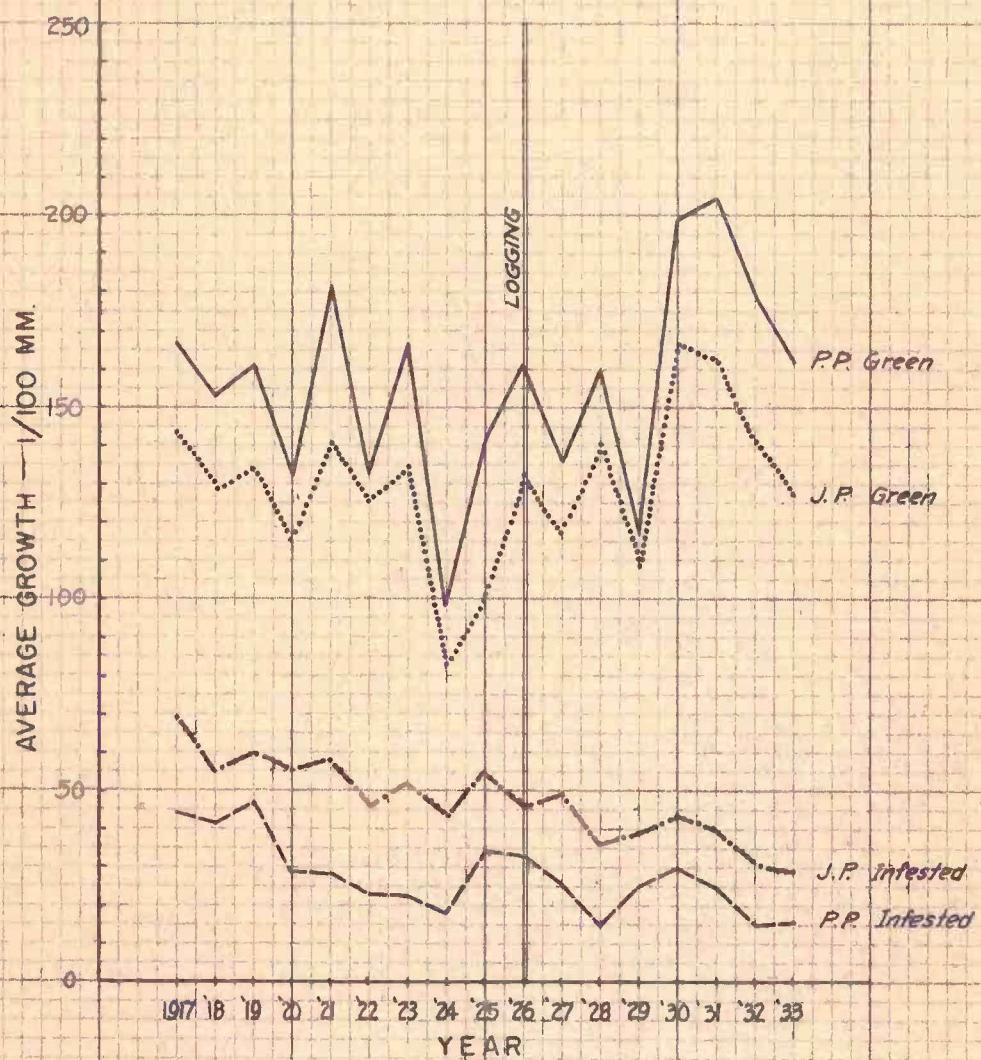
26. Infestation conditions in reproduction.

The shoot moth, Pamphilid sawfly, sheath moth, tip moth and pitch moth all are present on reproduction on this plot. However they are causing but a relatively unimportant type of injury due to the light infestations caused by the relatively small population of insects. Some injury to reproduction is caused by mistletoe.

## GROWTH OF GREEN AND INFESTED PONDEROSA AND JEFFREY PINE

PLUMAS NATIONAL FOREST

CUTOVER PLOT 23



1. CO # 24, Plumas National Forest.
2. Date of examination - August 7-14, 1934.
3. Location - S  $\frac{1}{2}$  Section 17, R 24 N, R 13 E. M.B.M.
4. Land classification - U.S. Government cutover 280 acres.
 

Private cutover	40 acres.
Total plot acreage	320 acres.
5. Surroundings - Open sagebrush flat to the south, similarly cutover lands to the west, north and east.
6. Altitude - 6,000 to 6,400 feet.
7. Timber type - Jeffrey Ponderosa Pine type site 4.
8. Topography - Steep, somewhat rocky southern aspect. Slope even with but minor gullies.
9. Soil conditions - Soil volcanic and partly granitic in origin. Shallow in depth, porous in structure and well drained. Somewhat rocky.
10. Brush cover - Chrysothamnus and Artemesia spp.
11. Precipitation - The plot lies in the 10-20 inch precipitation belt. Portola, which is the closest weather station has a recorded mean of 14.64 inches per year. The plot is 1200 feet higher than Portola although in a similar timber type.
12. Logged by Feather River Lumber Company. - 1928-1930.
13. Method of logging - Tractor skidding and Athey arches.
14. Marking practice - Dunning system, Marked by A. B. Everts.
15. Brush disposal - Brush and limbs to 4" piled and burned.
16. Gross timber estimates.
 

Original	19,080 b.m. Per Acre	100.0 %
Cut	15,860 b.m. Per Acre	83.2 %
Left	3,214 b.m. Per Acre	16.8 %

17. Cutover cruise - 10 % estimate.

Reconstructed from 1934 cruise for as of beginning of 1932.

Trees species	Trees	Acres	Per Acre	% Total	Vol.	Average Tree Vol.
Ponderosa Pine	1102	155,620	1.486 b.m.	81.4	141 b.m.	
Jeffrey Pine	2509	465,330	1,454	64.1	306	
Sugar Pine	11	6,840	21	0.9	622	
White Fir	380	39,100	122	5.4	103	
Incense Cedar	370	59,600	186	8.2	161	
Juniper	580	No volume				
Totals	4752	726,490	2,269 b.m.	100.0		

18. Losses in pine reserve.

	Per Acre.
Stand at beginning of 1932	3.44 trees
1932-1933 losses	0.05 trees
Loss per year	0.03 trees
% stand lost per year	0.87% (trees)
Increment per year	10.3 b.m.
Net loss per year	3.3 b.m.
	0.68% of stand.

Jeffrey Pine.	Per Acre.
Stand at beginning of 1932	7.05 trees
1932-1933 losses	0.24 trees
Loss per year	0.12 trees
% of stand lost per year	1.70 % (trees)
Increment per year	25.8 b.m.
Net gain per year	4.9 b.m.
	1,454 b.m.
	41.9 h.m.
	20.9 b.m.
	1.42 % (b.m.)
	1.77 % of stand.
	0.34 % of stand.

19. Composition of infestation

Insect species	% of total infested volume.
<u>D. brevicornis</u>	41.3 %
<u>Melanophila species</u>	34.1 %
<u>Ips oregoni</u>	1.4 %
Mixed infestation	23.3 %
Jeffrey Pine.	
<u>D. Jeffreysi</u>	23.1 %
<u>Melanophila species</u>	65.7 % 65.7
<u>Ips oregoni</u>	9.9 %
Mixed infestation	1.3 %

20. Tree selection (Dunning's)

Class	Total No. Trees	Total Inf. Trees	% Inf.	Per Year	Rel. to ave. loss.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
1	190	210	0	0	0.00	0.00							
2	716	1834	6	42	0.41	1.14							
3	126	297	4	22	1.58	3.70							
4	45	111	4	0	4.44	0.00							
5	11	21	1	1	4.54	2.38							
6	30	59	0	8	0.00	6.77							
7	11	55	1	5	4.54	4.54							

21. Diameter selection.

F.B.H.	Total No. Trees	Total Inf. Trees	% Inf.	Per Year	Rel. to ave. loss.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.	P.P.	J.P.
12	597	824	7	14	0.58	0.84							
14	150	281	0	11	0.00	1.95							
16	80	249	0	18	0.00	3.61							
18	82	496	2	14	1.41	1.41							
20	72	251	2	8	1.38	1.59							
22	45	225	2	3	2.52	0.67							
24	20	119	0	7	0.00	2.96							
26	50	40	0	0	0.00	0.00							
28	11	30	0	0	0.00	0.00							
30	11	42	1	2	4.54	2.38							
32	10	33	0	1	0.00	1.51							
34	2	0	2	0	50.00								
36	0	0	0	0	50.00								
38	1	0	1	0	50.00								

22. Growth trends in reserve.

See figure #

23. Pole stands and losses in poles.

% estimate - 10 % green cruise, 100 % insect losses.

D.B.H.	Incense Cedar	White Fir	Longepole Pine	Sugar Pine	Jeffrey Pine	Ponderosa Pine
4	1610	840	0	30	3489	2209
6	1890	150	0	10	5546	2930
8	650	530	20	0	2123	1184
10	280	540	50	0	1309	935
Totals	4370	2140	50	40	12466	7259

Losses in Jeffrey and Ponderosa Pine.

D.B.H.	1932-33 Inf. Trees		% Inf. pr Yr.		Rel. to average loss.	
	J.P.	P.P.	J.P.	P.P.	J.P.	P.P.
4	109	19	1.56	0.43	+	+
6	146	20	1.31	0.34	-	-
8	62	18	1.46	0.59	+	+
10	29	5	1.10	0.26	-	-
Totals	346	58	1.38	0.39		

24. Composition of infestation in poles.

Insect species % total infested poles.

Jeffrey Pine

<u>Melanophila</u> species	45.4
<u>Ips</u> <u>oregoni</u>	52.3
Mixed infestation	2.3

Ponderosa Pine

<u>D.</u> <u>brevicomis</u>	3.4
<u>Melanophila</u> species	77.6
<u>Ips</u> <u>oregoni</u>	19.0

Reproduction conditions.

Based on 32 1/10 acre plots of 1 % cruise of total area.

Tree species	0-6'	6.5-3.5"	Total	Over 3.5"
Ponderosa Pine	1.56 %	1.13 %	2.69 %	
Jeffrey Pine	4.72	2.09	6.81	
Juniper	0.06	0.13	0.19	
Incense Cedar	1.53	0.55	2.08	
White Fir	0.59	0.28	0.87	
Sugar Pine	0.06	0.00	0.06	
Totals.	8.52 %	4.16 %	12.68 %	10.16 %

25. Infestation conditions in reproduction.

Many types of insect injury to reproduction and small poles was noted on this plot. Some of these injuries also occurred in larger trees. Two types of injuries caused by plants were noted. The chief injuries were as follows. No quantitative data was secured.

1. Sawfly probably Itycorsis sp. (Hymenoptera, Pamphilidae) work was abundant on small Jeffrey Pine. At the time the cruise was made the season for their activity as larval forms was nearly over. As a result but 3 larvae were actually seen although their work was common.

2. Work similar to that caused by a needle sheath moth (Lepidoptera, probably a new species) was noted as present on the plot. This insect webs the needles together and mines out the sheathes.

3. Work of the shoot moth (Lepidoptera, species unknown) was found in moderate amounts on this plot. This insect mines the new growth of terminals and laterals but leaves the shoot before the injury becomes noticeable. The tree species attacked are Ponderosa and Jeffrey Pine, usually the larger pole sizes. However, reproduction also is injured.

4. Work of an undetermined needleminer in white fir also was noted as abundant. This insect webs several needles together and mines them.

5. Work of a pitch moth (Vespaminae sp.) was noted as abundant on the shaded branches of the larger trees as well as on poles and reproduction of Ponderosa and Jeffrey Pine. Globular pitch masses are formed near buds of the current years growth under which the larva works. The buds are killed.

6. Galls at the bases of needles and caused by Rhinodiplosis sp. Diptera were abundant on Jeffrey Pine.

7. Mistletoe attacks on reproduction, poles and reserve is a considerable factor affecting the vigor of the trees in this area.

8. A needle blight, which wilts the mid portion of pine needles was noted as abundant on parts of the plot. Specimens taken to plant Pathologists were not identified and, although physiological injury was suspected, evidences of plant pathological causes also were found.

9. Tip moth injury (Rhyacionia basederana) was present in the area but was not an important form of injury.

GROWTH OF GREEN AND INFESTED  
JEFFREY PINE

PLUMAS NATIONAL FOREST

CUTOVER PLOT 24

